The Mining and Metallurgical Journal

Vol. XXII. No. 21 New York, N. Y. August 1, 1900 Los Angeles, Cal. Price 15 Cents

Table of Contents, page 299 Index to Advertisers, page VII Buyers' Guide, page IX

INDEX TO ADVERTISERS; SEE PAGE X FOR BUYERS' GUIDE.

For other Professional Cards, see page XX.

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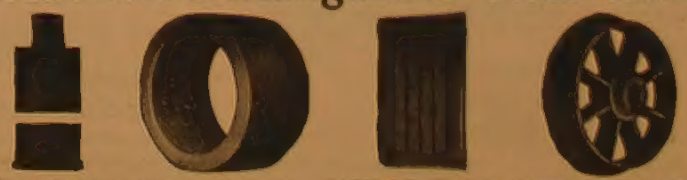

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The Mining and Metallurgical Journal

Entered at the Post Office at New York, N. Y., as Second-Class Mail Matter.

VOL. XXII. AUGUST 1, 1900 No. 21

F. W. EDELSTEN, Editor.
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ISSUED SEMI-MONTHLY

TABLE OF CONTENTS.

EDITOR'S NOTE.

Notwithstanding the addition of twelve pages in this issue, to provide room for the papers prepared for the Milwaukee Mining Congress, and for several extra pages of advertising, it has been necessary to omit two articles of unusual interest, which will, however, appear in the next issue. They are "The Cripple Creek Volcano," by T. A. Rickard, State Geologist of Colorado, and "The Enrichment of Gold and Silver Veins," by Walter Harvey Weed, of the United States Geological Survey.

A Magnificent Technical Society.

We are all justly proud of the American Institute of Mining Engineers, and are accustomed to think of it as one of the most admirable societies of its class in the world. So it is undoubtedly; and its scholarly and brilliantly edited proceedings form a most valuable contribution to the scientific literature of the day. That we may not become too vainglorious, however, we should sometimes reflect upon the splendid achievements of our German friends in the way of technical societies. The largest engineering society in the world, for example, is theirs—the Society of German Engineers.

It is said that one cannot cross a street in Germany without running down a doctor of philosophy; and at least one or two engineers would also be encountered on the way. 15,000 of these engineers belong to the society mentioned, and it naturally exerts a profound influence upon the engineering thought of Germany, and indirectly of the world. This influence is made effective, for the most part, through its weekly journal called the "Zeitschrift," which is by all odds the most important publication of its kind anywhere issued. About thirty-two pages of text appear each week, with ample illustration of a high order, many large folding plates appearing in the course of the year. A numerous staff of technically educated engineers edit the journal, and keep it extraordinarily accurate in every scientific detail. The cost of the publication to the Society last year was $125,000; but four-fifths of this amount was regained in advertising.

Although the annual dues of the members are only $5—far less than the value of the Proceedings alone—the Society is flourishing financially, and has a permanent fund of $180,000. This fund is utilized in two ways rarely if ever adopted in this country—in aiding the families of members, and in pensioning the employees of the Society.

A Department of Mines and Mining.

The need of a special executive department, headed by a member of the Cabinet and devoted exclusively to the mineral industry of the country, has long been emphasized both by representatives of the mining interests, who might be accused of impartial views, and by disinterested statesmen and public writers devoid of ulterior motives. Although the West would be especially helped by the proposed department, every section of the country would receive more or less benefit. Our mining interests are co-terminous with the boundaries of the national domain. The Western States, of course, are pre-eminently devoted to mining, but parts of the East, a good deal of the South, and many of the Middle States, have enormous amounts of capital invested in some of the various mineral industries.

While, therefore, we are decidedly of the opinion that the importance and national scope of the mineral industry make it proper and desirable that they should have such assistance as a well-organized and equipped executive department would afford, we think it worth while, nevertheless, to mention a fact often ignored by the advocates of the proposed department—the fact, namely, that the Government is already doing a good deal for the mining interests of the country through the Geological Survey. Elsewhere in this number we print a particularly strong and able argument in behalf of the new department by L. Bradford Prince, formerly Governor of New Mexico.

Mr. Prince presents the case with the skill of an advocate—and also, it must be added, with something of an advocate's unfairness, since he completely ignores the splendid work that the Government is already doing for the mining interests, and charges it with utter neglect of those interests. The Geological Survey covers a field much too broad for a single bureau, but its numerous and exhaustive reports on the mineral resources of the United States have been of immense value to the mining interests of the country. Elsewhere in this number will be found the substance of an address on this subject made by Charles D. Walcott, Director of the Geological Survey; and we commend his article to such readers as may not know of the good work going on under the auspices of the Survey.

Let us have a department of mines and mining by all means, if we can get it; and meanwhile let us gratefully acknowledge benefits already at hand, and make the most of them.

The United States First in Minerals.

It has not been so long in several important branches of the mineral industry, but to-day the United States unquestionably leads the world as a general producer of minerals. This supremacy, moreover, increases every year, each statistical review disclosing a new metal to the fore, or a longer lead of an old champion over its nearest rival, or some similar phase of superiority. It seems perfectly clear that the United States will long be the foremost country of the world in mines and minerals.

To particularize a little this general statement, reference may be made first to our amazing progress in the production of iron and steel. Only ten years ago we were second to England in this, the most important branch of the mineral industries. To-day England is hopelessly behind.

Never until the figures for last year were authentically compiled, could it have been said that the United States led the world in the list of coal-producing countries. But that position belongs to her now, and seems likely to become a permanent possession. 252 million tons was our output in 1899—a tonnage only slightly higher than that of Great Britain. In the current year, however, we have considerably surpassed our British cousins in this field, and unless the present outlook is altogether deceptive, we shall increase our lead rapidly. In this very month a steamer sails from Philadelphia with 4,000 tons of soft coal for the London & Northwestern Railroad—the first shipment of coal ever made to London from Philadelphia.

It is hard to understand how our little planet could get along without American copper, as we produced last year two-thirds of the entire world's supply. No other country begins to approach us in copper production. Our Lake Superior, Montana and Arizona copper fields seem almost inexhaustible, and our production last year of 291,000 tons will surely be progressively exceeded in the new century.

As for the precious metals, we cannot now claim first place in either gold or silver. The Nome and other new Alaskan fields may restore us to the first position in gold; and at all events we shall be at or near the top. As regards silver, we shall probably have to be contented with a subordinate rank, for the present at least, as existing conditions seem distinctly to favor our rivals in this branch of mining.

Without citing additional instances (though lead and zinc are tempting) of our advantages over competitors in these lines, it is sufficient to say that the outlook for continued prosperity in the mineral industries of the United States was never more promising than it is to-day: nature unlocks to us new treasures every year; our mining machinery, already incredibly effective, will continue to perform fresh miracles; and our men of brains and money will go on mixing one with the other in a widening range of industrial triumphs.

A National Department of Mining

Growth of the Cabinet—Mining Interests of Vast Importance—Agriculture Compared with Mining—Direct and Immediate Benefits.

By L. Bradford Prince, Santa Fe, N. Mex.

This is the most important subject that can come before this or any other mining congress at this time, and will continue so to be until the establishment of a department of mining becomes an accomplished fact.

In the first place it may be remarked that it has been the settled policy of our government from the beginning to increase the number of executive departments whenever the magnitude and importance of a subject and its need of national encouragement or supervision showed such action to be proper. At the beginning, under President Washington, we had but four departments and four cabinet officers—the secretaries of state, treasury and war and the attorney-general. In 1798, in consequence of anticipated wars with powers across the sea, the navy department was established; in 1829 the vast extension of our mail system made it proper that the postmaster general should become a cabinet officer. It was not until 1849, after the acquisition of Texas and northern Mexico, with a national domain more than doubled from its original area, that what is now by far the most extensive of all the departments, that of the interior, was established; and it is within the memory of all of us when the most widespread industry of the country, after long years of waiting, obtained proper recognition by the formation of the department of agriculture in 1889.

The latter case is almost exactly analogous to the one which we now present. No one is ignorant of the immense advantage which has accrued from the establishment of the department of agriculture, by the introduction of new plants from foreign lands, the exhaustive experiments with regard to soil and fertilizers, the organized effort to obtain relief from insect pests, and in a thousand ways which have tended to increase both the quantity and the quality of the products of the field and the orchard; and no one would now think for a moment of abrogating that department. Yet, as will presently be shown, the benefit to be derived from a department of mining will even exceed that of agriculture in its extent.

INCREDIBLE GROWTH OF MINING.

The increase in the importance of the mining industry in this country is really phenomenal. Many of those here present can remember when our only gold mines were those of North Carolina and Georgia, and the mint marks of the eagles and half eagles of that day remind us that the coinage was at Charlotte and Dahlonega. Of silver there was none. The first coal mine opened was in Rhode Island, but the product was so hard as to be almost incombustible; and while the mines of Pennsylvania soon after supplied both coal and iron, yet it was long years before copper was brought from the shores of Lake Superior and lead was found almost on the banks of the Mississippi at Galena. Then came the wonderful discovery of gold in the newly acquired region on the Pacific coast in 1848, and about a decade after that of both gold and silver in the Rocky Mountain section; and from those dates the onward march of mineral discovery and mineral production has been steady and rapid. Today it has passed the mark of $800,000,000 of annual production; in every one of the more important metals and minerals it exceeds the product of any other country; in iron it is one-third of that of the whole world; in coal it is four times that of Europe; and in copper it exceeds that of all other nations combined.

INDESTRUCTIBILITY OF MINERAL WEALTH.

While the agricultural product of the country is greater than the mineral, yet when we consider permanent substantial gain the latter is far superior. At the end of a year the agricultural product is consumed and has disappeared from the face of the earth; even in its production a part of the previous supply has to be destroyed as seed. But it is a peculiarly gratifying feature of the mining industry that it is constantly adding to the permanent stock of man's possessions of the wealth of the world.

It has been said that that man is a public benefactor who causes two blades of grass to grow where but one grew before; but what shall we say of the hardy miner, who, from the rocky fastnesses of God's eternal storehouse, brings forth untold riches, without the loss of one dollar's worth of previous accumulation? It is an absolute addition to the available material for man's use or ornament; it is new matter placed at his disposal; practically it is a creation, for it is extracted from the bowels of the earth, where it has remained from the foundation of the world, and where, but for the energy and enterprise and skill of the miner it would lie dormant forever. Much of it is by nature in forms that bear no resemblance to the brilliancy of the molten metal, sometimes concealed in a hundred—yes, a thousand—times its volume of worthless rock; but the ingenuity of man extracts it in perfect purity, ready for the varied uses of human life.

The gold and the silver of King Solomon's temple are still in existence somewhere in the world, after doing their work of utility or beauty for thousands of years. They may have changed their form scores of times, but once brought into the hands of man as his possession, they continue in their round of usefulness, passing from nation to nation, from generation to generation, through all mutations of place and contradictions of purpose for countless ages. Battered or melted, hidden in secret vaults or buried in the earth, losing all semblance of earlier use or form, through every vicissitude of time and place, the substance still remains, to be the creature of man's changing tastes and fashions to the end of time.

In no department of industry can government aid and supervision be of such direct and immediate benefit. By systematic exploration of the mountainous portions of the public domain vast bodies of minerals may be brought to light which otherwise would long remain unknown. Geological investigation will direct the path of the untiring prospector; save a vast amount of labor and expenditure now devoted to useless ends and leading only to disappointment; and increase the extent of valuable discovery and development to a marked degree. Every invention which utilizes ore hitherto unavailable is a benefit to the whole country. An improved process which cheapens the treatment of mineral even a single dollar per ton very largely increases the production of metal and the extent of the mining industry, as the amount of ore increases in a surprising ratio with each reduction of grade. It would be the business of the department, by an exhaustive series of experiments, to discover or invent processes of treatment, mechanical or chemical, which will reduce to a minimum the expense of treatment, and thus render available vast bodies of ore now useless for any practical purpose. By the dissemination of its reports, it would draw attention to the value of minerals that are now daily passed over unnoticed because their character is unknown, or their worth unrecognized.

KNOWN AND UNKNOWN BENEFITS.

In fact, the methods in which systematic investigation and experiment can increase the mineral product are more numerous than we can imagine in advance of experience. There are imperfections in our national laws which retard prosperity and production, which individuals seem powerless to amend, but which would be remedied without delay on recommendation of a mining department. For instance, in dealing with the large areas of mineral lands within the boundaries of land grants made by the governments of Spain and Mexico, the United States expressly reserves all gold, silver and quicksilver, presumably for the benefit of the discoverer or worker; thus providing a dual ownership heretofore unknown to our laws. But though ten years have passed and congress has held session after session, not the slightest provision has been made for the use of any of these minerals; and, so, though in many cases their situation is well known, they remain unprospected and unworked. With a cabinet officer to attend to the interests of the mining community, this need would have been officially presented to congress and remedial legislation obtained years ago.

In every way the use of metallic and industrial minerals is being increased in a rapid ratio year by year. A moment's thought will show the truth of this. From the humbliest household utensil to the tall sky-scraping building which rivals the tower of Babel in its presumptuous altitude, metal is taking the place of wood and other material.

No stronger illustration of this can be found than in the architecture of the new navy of which we are so deservedly proud. Half a century ago the marine defenders of old England were aptly called her "wooden walls," built as they were, of the choicest oak and propelled by sails of cotton and ropes of hemp. How entirely is this changed and the vegetable kingdom superseded by the mineral? Now the hull and bulwarks of iron and steel, the ordnance of steel and bronze, all propelled by great metallic engines fed by thousands of tons of mineral fuel, unite in proclaiming that on the water, as on the land, the dependence of the nation is on the product of the mine.

OF NATIONAL VALUE.

In this subject the miners of all sections and of every class are equally concerned. Those who are interested in the coal of Pennsylvania, the copper of Michigan, the iron of Wisconsin or Alabama, or the lead and zinc of Missouri, unite with their far-off brethren of the gold and silver regions of the Rocky Mountains and the Pacific slope in demanding this encouragement and development of the business in which all are engaged. And the people at large have no less interest, as every improvement made in the extraction and treatment of ore lessens the price of all articles of metallic material, both great and small.

The establishment of a department of mining will not only be a proper recognition of the importance and magnitude of this great industry, but will have an inspiring practical effect in stimulating invention and industrial advancement and the development of resources now dormant and useless.

Other countries with not one-tenth of our annual mineral output have ministers and departments devoted to mining; let us, in the United States, not be behind them in granting this national encouragement and aid to the mining industry of our own land.*

Tennessee as a Mining Field.

Rich Coal Beds—A Great Ore Belt—Copper and Manganese—Finest Marble in the World—Zinc and Lead, Phosphates, Etc.

By Henry V. Maxwell, Knoxville, Tenn.

Five thousand square miles is the usual estimate of the Tennessee coal fields, but I am going to cut it in two, and then ask you to multiply it by what I know to be facts, and the figures at twenty-five cents a ton will suffice for the purchase of kingdoms. This whole area is underlaid with four blanket veins above water level, ranging in thickness from twenty-four to sixty inches, while below water, near the surface, three veins are found, aggregating a grand total of twenty-five feet. One vein of coal six feet thick will yield at twenty-five cents a ton per acre two thousand dollars. Multiply this by the thickness and the total area, and the product will confuse the thinking powers of any man. I leave you with the figures as a basis upon which to calculate the value of a single mineral element of the state.

The coal in this field is all bituminious and as good as the world produces, different localities furnishing coals especially valuable for domestic purposes, gas, coking and steam. As to the last-named, a report of experiments made by the government under the boilers of the war vessel "Montgomery," on Feb. 3, 1895, may be obtained from the Secretary of War; while as to the other qualities innumerable proofs are obtainable from dealers and producers.

I will not tire those not interested, especially in coal, by going into details, except to mention the facts that much valuable timber stands upon the plateau above the coal; that oil wells are now flowing in the field and returning good dividends; that ample water is at hand; and that favorable climatic conditions make possible continuous labor. Moreover, from the coal fields of Tennessee to the best harbors on the Atlantic Coast, the distance is only 195 miles.

A GREAT ORE BELT.

Passing from Alabama through East Tennessee and into Virginia, runs the great brown ore belt of the Appalachian region. Details as to its value have been published a thousand times. When you read the analysis of Alabama and Virginia Brown Hematites, or Limonites, you have the analysis of the Tennessee ores, as they are practically the same, maintaining an average at the furnaces of from forty-five to fifty-four per cent. This belt enters Tennessee in Polk county, and passes out of the state at Johnson county, being about 200 miles in length by from ten to twenty-five in width. Traveling east from its entrance into the state until you reach the furnace at Embreville, Unicoi county, you have passed over enormous bodies of undisturbed ores—the largest in the South.

At Ducktown, Polk county, Tennessee, the only

*Paper prepared for International Mining Congress, Milwaukee, June, 1900.

copper veins in the state are being worked. Capping those veins of solid parytes, lies a deposit of gossan from the oxidization of the copper barytes. The iron averages about sixty feet deep, two hundred feet wide, and twelve miles in length. Shipments run about 55 per cent metallic iron. Some forty years ago a few men accumulated fortunes mining the black oxide which lay between the gossan and unaltered ore. Work was abandoned, however, until some ten years since, when the Ducktown Copper and Sulphur Company erected smelters and began treating the barytes. In 1899, under the management of W. H. Freeland, this company mined and treated a considerable body of ore. During the year, the Tennessee Copper Company of New York was organized, and under the direction of Randolph Adams, three properties are being developed, and large works built for the treatment of the product. The ore is practically limitless.

We will pass from the Childowees northwestward, through small bodies of Brown ore capping the knobs and low ridges of the valley, and near the fot of Waldron's Ridge enter the Red Fossiliferous, or Clinton ore belt. The territory thus traversed has been disturbed by eruption, and the strata dip at various angles. As we reach Waldron's Ridge, the eastward edge of the coal-field, the strata stands perpendicular, carrying side by side coal and veins of Red Fossiliferous ores, and after passing through the gaps we find the undisturbed field underlaid with horizontal veins of coal. Paralleling Waldron's Ridge its entire distance, we find upon its eastern slope veins of red ore averaging from two to seven feet attaining unknown depth, and running an average of about forty-two per cent metallic iron. The belt is some twenty miles in width, and is the same upon which Birmingham, Alabama, is fast climbing to the top.

Accompanying the Brown ore deposits, and in fact practically scattered all over the valley from Chattanooga eastward, manganese is found upon the surface. Occasional small shipments have been made, but no intelligent, systematic prospecting for the ore has been done, although it is certainly justified.

Personally unfamiliar with the western iron district of the state, I am indebted to our eminent geologist, the Hon. J. B. Killebrew of Nashville, for the following data: "The Western Iron Belt lies west of Nashville, and extends through the state, north and south, sometimes overlapping the Tennessee River. It passes north into Kentucky and reaches the Ohio River. It also extends south into Alabama. In the state of Tennessee it includes something over 5,000 square miles. Wholly, or in part, in this Western Iron Belt, and in every one of the several counties, deposits of Brown iron may be found in sufficiently large quantities to justify mining."

Mr. Killebrew reports assays from the above district as high as 59.21 per cent metallic iron, and tells us that the first iron produced west of the Cumberland Mountains was made in this district by General Robinson in 1797. Near Clifton, in Wayne county, is a bed of anhydrous red oxide of iron, which is very valuable both for paint and use in the furnace. This ore shows metallic iron 55.67 per cent.

STRONG AND BEAUTIFUL MARBLE.

Great in importance is Tennessee marble, the best marble in the world. I say it not at random, but from a knowledge of facts that have never been, and in my opinion will never be disputed by any man. The marble is not only beautiful, but has a burden-bearing strength equal to granite, while in absorption it surpasses any like stone known. It ranges in color from the pink of a maiden's cheek into gray almost white, and into mottled and beautiful rich chocolates. In some instances it is filled with rare crenoids of peculiar form, many inches in diameter. As monumental stone Tennessee marble has no equal, as its compact form renders it unliable to injury by frost, and its density causes it to wear almost as well as granite. I have seen it where the tannin from overhanging oaks had marred its beauty until the lettering was almost obliterated. I have seen it, where a bottle of red ink has been broken upon a slab, made in a minute, with a little soap and water, almost as white as snow. No other marble in the world will bear these tests.

Tennessee marble is as common as the commonest limestone, and the deposits are practically immeasurable. The territory in which it lies covers a belt some one hundred and fifty miles long by thirty wide. There is more marble lying in the ground in Tennessee than has ever been taken from all the quarries in the world, and were there no building stone used in the United States for a hundred years other than Tennessee marble, it would not be exhausted.

Along the foothills of the Chilhowees lie bodies of roofing slate which is said to be equal to any slate. Were only one section opened and operated, it would suffice to supply the demand of all the Southern States from now until last call is made.

Along the valley of the Tennessee lie deposited in the clays large bodies of barytes, of good quality, except where injured by iron, but much of it free from stain, and in quality equal to any known.

LEAD AND ZINC DEPOSITS.

Another element of mineral resources may be found in the zinc and lead deposits of the state, though they have been worked only in a desultory way. The first thoroughly equipped and amply capitalized zinc mining company has yet to enter the field. Some time ago a smelter was built and successfully operated for a number of years at Clinton. Two companies are now shipping crude ore from the Clinch River and from Straight Creek, where thousands of acres of land are underlaid with good deposits of ore, in some cases carrying large percentages of lead, and in others having no lead. It is not only within these districts that zinc is found, for the same belt may be followed from Chattanooga into Virginia. Eastward from this belt some twenty miles, and lying parallel with it, another zone carrying zinc entirely free from lead runs for two hundred miles through the state. The ore occurs upon the surface, first in the form of carbonates running about forty per cent, while at a few feet in depth blende is encountered in almost solid masses and deposited through heavy ledges of dolomite in amounts which will unquestionably pay well to concentrate. As stated, the formation of the valley has been broken, and it is the edges of the former blankets which are found at or near the surface, assuring prospectors of profitable and continuous ore bodies from the first openings.

SOME STATISTICS.

In 1896 Tennessee produced marble to the value of $369,277 as against a total value of the United States of $2,823,596. The busy appearance of the quarries and mills indicate that the present year's output will largely exceed that of 1895, but no figures since the above are obtainable.

In 1898 the production of coal in Tennessee amounted to 3,736,134 short tons, with a value of $3,706,617, or an increase of 651,386 short tons over 1898.

During the year 1899 the production of coke in the state amounted to 440,157 tons, being an increase of 50,625 tons over the previous year.

During the year 1899 the total production of iron ore in the state was 593,227 tons, as against 406,573 tons in 1892. Of zinc blende, the state produced 3,750 short tons. One Tennessee industry of which we may be proud is that of phosphates. Large amounts of capital have recently been invested in the industry with the result that in the year 1899, the Louisville & Nashville railroad carried 440,661 long tons of rock shipments, grading from 65 to 80 per cent pure bone phosphate and bearing an average value of about $4.50 per ton.

Take the map of the United States. Put your finger on the territory where we have traveled. Draw a line from Chicago to the sea. Consider the growing foreign demand for our raw and finished products. Take it as a certainty that the Nicaragua Canal will be built. Multiply the possibilities of this section. Consider that timber, coal, iron, marble, lie side by side within a few miles from each other throughout the field we have traversed. Remember the favorable climatic conditions. Picture a great cross-country railway line from the point where I stand through the granaries, stock farms, and manufacturing cities, for hundreds of miles, carrying seaward your products and ours, and bringing back to you what you may demand from lands over the sea—take this far-reaching view, and if you cannot see that the Central South is the great accumulative center of the near future, then we look far apart.*

*Extract from Paper prepared for International Mining Congress, Milwaukee, June, 1900.

Placer Mining by Cableway.

An interesting experiment in placer mining by cableway, which has thus far been much more than successful, is being carried on by the German Bar Mining Co. of Virginia City, Mont. The company has in use a Lidgerwood radial cableway with self-filling and self-dumping buckets of one and a half yards capacity, working over the tailings of historic Alder Gulch. Through the courtesy of the Lidgerwood Mfg. Co., of New York, the makers of the cableway and buckets, we are permitted to present herewith three photographic views of the apparatus in operation.

The grade of the German Bar Co.'s property is too flat to permit of the regular placer method, and the cableway is brought into use to solve the threefold problem always presented by flat placers of low value—namely, excavation at low yardage cost, delivery of gravel at sufficient elevation to use sluice of ample length and grade to save fine gold, and the delivery of tailings at sufficient height to provide ample room for their disposal.

The span covered by the cableway is 400 feet in length, and the load excavated and carried by each bucket is one and one-half cubic yards. The pivot tower contains a large hopper whose bottom is forty feet above the ground, and it is through this that the material is delivered to a thirty-inch sluice over a five per cent. grade 200 feet long, which finally delivers the tailings at an elevation of twenty-five feet above bedrock. This tower also has a ball-bearing top of bonnet so arranged with cables and guys that it may turn on its apex, allowing the traveling head tower to move through an arc of 180°. The latter carries engine, boiler and cable anchorage, and travels easily and quickly on curved tracks. The engine has double ten by twelve cylinders, cast steel gearing, and is exceedingly strong. The hoisting drum is thirty-three inches in diameter, and the conveying drum fifty-four inches. The hoisting rope is rigged on the crane system, thus insuring greater power in digging and high speed in conveying. Fall rope carriers are required on each side of the carriage. The boiler is fifty-four inches in diameter, locomotive type and built, like the engine, for 150-pound working pressure.

SELF-FILLING BUCKET USED IN PLACER MINING BY THE GERMAN BAR MINING CO.

The traveling tower permits excavations along radial lines, and a semi-circular or fan-shaped pit is worked out around the hopper tower, which stands on bedrock in the pit previously worked out. The tailings flow over this old pit in the rear of the tower. After this semi-circular pit is excavated the entire plant is moved forward and another similar pit made.

THE BUCKET AND METHOD OF WORK.

The Lidgerwood patented excavating bucket is a development of the scoop or drag bucket principle, which is the result of a long and very expensive experience under most severe working

HOPPER, GRIZZLY AND GOLD-SAVING SLUICE, GERMAN BAR MINING CO.

conditions. Drag buckets have been used for some time in sand and gravel banks where loose material and high banks made digging easy. This bucket was developed to handle shale fire clay and to fill in a low bank, where it could not be loaded by thinly shaving the bank, as in gravel work, but must be crowded right into the material and be even capable of digging to advantage on level ground.

The method of excavating is as follows: The carriage, with bucket hanging teeth downward, is run out on the cable, and the bucket dropped at the toe of the bank. The bucket strikes the ground teeth first, settles down on its bottom, and, as carriage continues toward the head tower with hoisting line slack, the ball falls into natural position, the back catch automatically locking itself, ready for digging. When the carriage has reached a position much nearer the tower than the bucket, the conveying-drum brake is thrown in, the carriage held stationary on the cable while the hoisting rope is tightened, giving to the bucket a long inclined draft, which enables it to fill. This draft may be varied by simply changing the position of the carriage with respect to the bucket.

The ease in changing the angle of draft is of the utmost importance in adapting it to the character of material and depth of cut.

The bucket draws well into the material, the strain increasing until the teeth are well buried in the ground, when the leverman releases the conveying brake, allowing the carriage to slip back gradually to a position over the bucket, thus gradually changing the draft, the bucket meanwhile continuing to dig until the carriage is directly over it, by which time it is filled. It is then hoisted and conveyed to be automatically dumped into the hopper.

On the level or difficult ground the long draft, gradually decreasing, is absolutely necessary, and it can only be secured with the endless-rope system. Even in high banks the changing draft is of great value, as the bucket may be hoisted as soon as filled without having to drag it through all the material higher up the slope. The changes are made without stopping the engine, or motion of bucket, and effect a decided saving in time of filling.

The gravel, automatically dumped into the hopper, washed over the grizzly, which separates rocks and boulders, and down the gold-saving sluice by a stream of water constantly flowing into the hopper through a twelve-inch pipe from a hillside ditch under a forty-foot head.

The bucket has a capacity of one and one-half cubic yards, and 400 buckets have been filled in ten hours. Boulders of 500 to 600 pounds can readily be picked up by the bucket, when loosened, but it is not found desirable to pass them through the hopper.

HYDRAULIC METHOD OF ASSISTANCE

Water from the hillside ditch being available, the method of working is as follows: As soon as the bucket has made a channel, or cut, through the material, a ground sluice from the creek is used to wash the top loam and finer materials into this cut, and this ground-sluice water, constantly rushing down the cut where the bucket is working, carries the lighter materials away into a bed-rock flume, leaving only the gold-bearing gravel for the bucket to take to the hopper. After the sides of the cut have caved in, a small hydraulic pipe (6-inch—80-foot head and 2-inch nozzle) is used to clean the bed-rock and wash such material into the bucket channel. The head tower being traveling, the radial bucket cuts can be made as close together as desired. This permits work in a new cut while the pipe is assembling the bed-rock cleanings in the old channel, to which the bucket may be returned when desired. Five men are required for the cableway operation—leverman, fireman, signalman, hopperman and rigger. When the pipe is used (only part of the time) the labor force is increased by a pipeman and two assistants.

The Geological Survey and Its Work.

What this Department Is Doing for America's Mining Interests—Its Duties and Purposes—What It Has Done and What It May Not Do—A Suggestion as to a Department of Mines.

By Charles D. Walcott, Director of the Survey.

It has been well said that there are three standpoints from which the relations of the Geological Survey to the mining industry in general may be viewed: first, the more purely scientific or geologic side; second, the technical side; and third, the commercial side.

The general principle upon which the Survey has been doing its economic mining work is, that it should endeavor to accomplish for the mining industry, as a whole, what the individual mining engineer or mine owner cannot succeed by his unaided exertions in doing; that it should not undertake to do what could be done as well, if not better, by individual exertion; that it should not interfere, either favorably or unfavorably, with the private business of individuals or corporations, or enter into competition in their legitimate occupations with professional men, such as mining engineers, etc. This is implied in the clause of the organic law of the Survey which provides that —"The Director and members of the Geological Survey . . . shall execute no surveys or examinations for private parties or corporations."

If it were more generally understood that such is a proper limitation of the work of the members of the Survey, they would not be asked, as they frequently are, to tell some individual or corporation whether his or its land contains valuable mineral deposits, since all the information they are at liberty to impart with regard to that land is contained in the published maps and reports, which may be obtained by all. If the individual or corporation is unable to deduce from these publications all the commercial data that may be desired, a mining engineer should be employed for the purpose. An attempt by the Survey to acquire and communicate such information respecting any special parcel of land would be in the nature of a report for private parties, which would be an interference with the business of the mining engineer and a violation of law. Neither should the Survey be called upon to assay or analyze ores for private parties, for that is manifestly interference with the business of the assayer; nor should it be called upon, as it sometimes is, to tell a man what process, or which of two or more processes, is best adapted for the treatment of his ores. Even if the members of the Survey were fitted to pass judgment upon the relative value of technical processes or machines, and should pronounce such judgments, they would naturally be regarded as interfering unwarrantably with the person or corporation owning a process or machine which was not favorably considered in their report. If it were proper that work of this nature should be done, it would be impossible to acquire the knowledge necessary to meet such demands with the amount of money at present available, or even with ten times that amount.

The means for economic work being limited, only a small proportion of the broad field opened for investigation can be occupied at any one time. On this account, the energies of the Survey have been devoted to those branches of investigation which were of immediate use to the greatest number; and these have been, in the main, investigations leading to broad general deductions.

GEOLOGIC INVESTIGATION.

In the field of more purely geologic investigation, the general object has been the determination of laws which govern the formation of deposits of the useful minerals, and of the rock-formations in which they are most likely to be found. This object can be attained only by long and careful study of many and varied deposits—as far as possible in the condition in which they were originally formed. Ore deposits are as a rule the result, not of a single process, but of many successive concentrations of minerals; and in those deposits which are found near the present surface, the effects of the latest of these processes—weathering or the action of surface waters—are likely to have obscured all others. In order best to accomplish the object sought, the first studies were made of mining districts in which mining developments have been most extensive, the mines are deepest, and the most varied forms of ore deposits have been disclosed.

In the prosecution of these studies, the geologists often obtain results of immediate value to the miners and mine owners of the particular district under investigation, such as the determination of the probable direction which the ore bodies will take in unexplored ground, the faults which are likely to cut them off, and other obvious limitations which geologic conditions may suggest. These results are often of secondary importance as compared with the more general deductions, being useful to only a few persons interested in a limited district, while the general deductions, if correct, are of benefit to the whole mining community.

A brief statement of the underlying principles which govern our choice of fields of work is made, because that work has been frequently criticised: the criticism made by miners being that the Survey chooses developed districts, where the general facts with regard to ore deposits are already known, rather than undeveloped districts, where the predictions might be of more use to those who own mines, and might actually help in their development. From a partially developed district we can usually learn only superficial facts, which are not likely to yield any contribution to general laws. Whatever may be said of the probable value of such a district belongs to the province of the mining engineer rather than to that of the Government geologist, since it involves such preliminary work as sampling of ores, prospecting, development, etc., which the geologist cannot do.

Another criticism has been that more work is done in one state than in another. But if it be admitted that the principles mentioned should govern our work, it is evident that we cannot be guided by geographic or political considerations, but that we must study ore deposits where they can be studied to the best advantage. In the topographic work of the Survey a more or less general geographic distribution has been possible, and it is also desirable; but in geology the Survey must continue to be the judge of the importance and interdependence of the problems to be solved and of the best method of solving them.

In the original plan of Survey publication, the monographs were designed to set forth each the results of a complete and, so far as possible, exhaustive treatment of a given subject or group of geologic phenomena; the bulletins were intended for reports of special studies, not necessarily exhaustive, but, for one reason or another, deserving of immediate publication; while papers in the annual report were intended to be less technical in

character, of general rather than special interest, and to include abstracts, in somewhat popular form, of monographic studies. It was found desirable, as time went on, to modify this plan, as it has been found wise to adhere not too strictly to that laid down for the conduct of the work itself. Thus, for a time, the outside demands for economic surveys, solely on the secondary ground of their usefulness to those interested in mining in the special districts examined, increased very rapidly, while the force and funds at the disposal of the economic division were actually decreasing, so that the monographic treatment became unadvisable as a matter of policy, and the work was spread over a greater number of regions by devoting less time and labor to each.

A correct geologic map is the first and most essential basis for the study of a mining district, and where the deposits are beds in sedimentary strata, as is the case with coal, and sometimes with iron ore and other substances, it furnishes practically all that the mining engineer needs for opening and exploiting the mines. By the folio publication, however, a new avenue is opened for disseminating geologic information promptly and without waiting for a final and exhaustive report. Where important groups of mines are concentrated within small areas, special maps of size to fit the folio are made of those areas, on the largest practicable scale, accompanied by sections and explanatory texts setting forth in concise terms the main facts of importance to the miner, and these are published as special folios; that is, folios do not form an integral part of the regular Geologic Atlas of the United States.

TECHNICAL INVESTIGATION.

In the line of what may be considered technical studies, the duties of the Survey toward mining industry are less easy to define; for in this line there is more danger of encroaching upon the legitimate field of the mining engineer or metallurgist. Yet the same general principle is applicable here; namely, that the Survey should confine itself to those investigations which it is better fitted to make than the individual. Thus, in our early work on Leadville, where lead-smelting had recently reached a stage of development hitherto unknown in this country, it was thought that a scientific discussion of the processes involved, in the light of the improvements made in practical methods, would be of advantage to the smelting community throughout the country. It was found, however, that so great was the commercial importance of the industry, and so rapid the advancement in metallurgic science, that the delays inherent in a Government publication greatly impaired, if they did not altogether nullify, its value.

Except in a few special cases, it has not, therefore, been thought advisable to follow out this line of work.

It is evident that the investigation of technical processes in their commercial application is not a legitimate function of the Survey. Its employes are expressly shut out from a commercial use of their knowledge, and are chosen for their proficiency in geology rather than in technology. There may arise cases, however, in which it will appear possible for them to determine the underlying principles or laws that should govern some widely applied technical process, and in which it will seem advisable and proper for them to undertake such investigations.

COMMERCIAL OR STATISTICAL INVESTIGATIONS.

There remains to be considered the relations of the Survey to the purely commercial side of the mining industry, and here the principle of doing what it is inherently better fitted to do than is the individual, is more easy of application. It seems evident that the collecting of accurate statistics of the mineral productions of the country, which form the most important basis of all mining business, is a prime duty of the Survey. No branch of statistical science is in greater need of technical knowledge and thorough system than that which deals with mineral production, and none is more liable to be led into error, if the collector's opinions are in any way biased by his interest. There is no body of men more absolutely disinterested than the employes of the Survey, since, under the law, they can have no commercial interest in the subjects which they treat. Their field of work is so wide that, by one or another, a certain personal familiarity with all the sources of supply of the various mineral products of the country is acquired, which is available for the guidance of the statistical division.

At the last session of the Fifty-fifth Congress an amendment was introduced establishing a Division of Mines and Mining in the Survey. This extended its sphere of statistical work to gold and silver, and made a special appropriation for the division. It also provided means for the more prompt publication of its reports. Had this amendment passed, it is believed that the scope of usefulness of the work of the Survey would have been very materially increased. All of its various economic branches would then have been conducted under the supervision of a single chief, by which means a more uniform and comprehensive system, both of field work and of publication, might have been inaugurated.

STATISTICS OF MINERAL RESOURCES.

The statistical work of the Tenth Census brought together such men as Emmons, Becker, Pumpelly, Peckham, Willis, Eldridge, and others who contributed to the volume on mining. Later Albert Williams, Jr., was placed at the head of a division of the Survey created for the purpose of carrying out this work, and known as the Division of Mining Statistics and Technology.

Mr. Williams' plans were so well made that the results were excellent, and they admitted of simple expansion as the needs and facilities of the Survey made such expansion necessary and practicable. Mr. Williams' aim was to use the small means at his disposal to secure the co-operation of every individual and institution for that particular contribution upon which he or it was the best authority. Primary attention was paid to locating and describing the known mineral localities, even down to those of rare elements. The work was arranged wisely, according to mineral substances, rather than geographic regions, since each mineral industry was the interest intended to be served. This resulted in the series of publications called the "Mineral Resources of the United States." At the present time the work is practically an annual census of the product of all mines, except those of precious metals. The statistics of gold and silver were excepted in the original plan, in 1882, out of courtesy to the Director of the Mint, who desired to retain in his own office this portion of the work.

CABLEWAY USED FOR PLACER MINING BY THE GERMAN BAR MINING CO

When the division abandoned the subject of mining technology, its designation was changed to the Division of Mineral Resources. In accordance with the duties implied by this title, more and more attention has been paid to statements of the geologic and geographic distribution of our mineral wealth, whether developed or not; and the immediate future will see this important work of the Survey expanded. Special subjects, studies of which are now in a more or less advanced stage of completion, are the phosphate deposits of Florida, the clays of the Eastern States, bauxite in Arkansas, fuller's earth in South Dakota, and the asphalts and bitumens of the whole United States.

HYDROGRAPHIC INVESTIGATIONS.

For more than ten years the Division of Hydrography of the Survey has been making measurements of streams and computations of their daily discharge at various points. At the same time, it has been investigating the movements of underground waters and the causes which give rise to them. The results have economic importance to the miner in his underground operations, as he must often contend with water, and his ability to dispose of it successfully may govern the question of profits. He often seeks in flowing water the power for operating, directly or indirectly, mines, mills, etc. In many sections the lo-

cation of reduction works is governed largely by the question of water supply and its permanence through seasons and years. The results of the investigations of the hydrographers are sought in considering the erection of plants of this character.

There is also an indirect way in which the question of water supply affects the feasibility or profits of mining. Throughout the western third of the United States, from the Rocky Mountain region westward, there are great deposits of ore, the value of which per ton is so small that they cannot be profitably worked unless many conditions are favorable, such as cheap foodstuffs and ready transportation, by which the cost of living and of labor may be reduced. The region as a whole is arid, and farm and other products, brought from the humid regions, are expensive. By the development of agriculture through irrigation, and the building up of small producing communities throughout the semi-arid and arid West, the cost of living is greatly reduced, and it becomes practicable to work to advantage mineral-deposits otherwise unprofitable. This dotting of the country with farms and villages is possible through a careful conservation of the available waters, such as can result only from a thorough knowledge of the natural conditions. This knowledge is being obtained, through the Division of Hydrography, as rapidly as the means available will permit.

RELATIONS OF THE GOVERNMENT TO THE MINING INDUSTRY.

The results already attained by this single bureau of the Government form a monument to the intelligent interest taken in its work by Congress and the hearty support given it by the several Secretaries of the Interior. It is my belief, founded on years of experience, that the American people, as represented by Congress, desire to do what is right and just for governmental scientific organizations. Individual mistakes and narrowness of conception and action will occur at times, but as a whole the outlook is good, both for science and for the people of the nation.

I have been led to make the preceding observations because it has not been uncommon to hear and read criticism of Congress and of governmental methods of doing things. Governments, like individuals, oftentimes learn and act slowly.

With these thoughts in view, let us consider the relations of the Government to the mining industry. For several years there has been a more or less active movement in progress to establish a Department of Mines and Mining. The latest bill on the subject, introduced by J. A. Barham, of California, has many commendable features; but unless there is a decided change of sentiment in a future Congress, as compared with the last Congress, there will be nothing accomplished in this direction for some time to come. The function of the new Department, as defined in the bill, is "to acquire, by examination, practical and scientific experiments, geological research, or otherwise, useful information on subjects connected with mining in the general and comprehensive sense of the word, and to diffuse the same among the people of the United States." It is further provided that the Geological Survey shall be the nucleus of the new Department.

If the present bureau should be given authority to establish a division of mines and mining, with an appropriation for extending its mining and statistical investigations, all that the Barham bill provides for, as quoted above, would soon be an accomplished fact.

There is no doubt in my mind that the mining interests of the country are entitled to direct recognition by the Government. If those interested in the mining industries wish such recognition, I would suggest that they first secure legislative provision for a division of mines and mining in the Geological Survey, and later, if it is found desirable, ask for the establishment of a Department of Mines and Mining. Meantime, pending decisive action, the Geological Survey will continue to aid, so far as practicable, in the development of the mineral resources and mining industries of the country.

A New Dry Gold Washer.

T. M. Jones and James McNeese of Leadville, Colo., claim that they have invented a dry gold washer of novel design adaptable to placer mining in dry countries. They have made tests of the machine in the famous old placer field in California Gulch in the Leadville district, and have reported a saving of ninety per cent. A working model of the machine is on exhibition at the Leadville machinery depot.

Mining, Mine Management, and State Inspection.

Safety, not Cheap Production, Should Be First Consideration—Rigidly Enforced Legislation Required—Laxity of Present Methods.

By Henry J. Brennan, Carbondale, Pa.

Human life in mining as well as in all other operations ought as a matter of conscience and fellow-feeling to be of first importance. The responsibility resting on the mind of the conscientious mine manager, in so far as the lives of his workmen are concerned, is very great. Ignorance or negligence on his part may mean not only loss of life, but also misery and ruin for the ones depending on the earnings of the husband and father.

It is, alas, too true in many instances that the position of General Manager of Mines is regarded in the light of what is termed "a soft snap," being very often secured through family ties or influence of one kind or another, regardless of the fact that the post is one of grave responsibility. It is unfortunate that the law does not provide for the examination of every one holding positions of this kind. In many instances in the coal regions of Pennsylvania men are filling these positions who neither by education nor practical training are fitted for their duties. As well might an untrained volunteer be placed in command of a well-disciplined army with a view of directing a series of great military movements.

A mine manager of this kind classes cheap production as first in importance. It is his whole cry from morn till night, regardless of the workmen's lives, or the future of the mining property. He is an autocrat through the influence that secured his position. He makes life a burden for his subordinates, as well as for the practical, conscientious manager who regards the lives of his workmen as first in importance, and next the systematic and economical working of the property entrusted to his charge.

Experience does not seem to furnish a remedy. Disaster upon disaster, involving not only great loss of life, but millions in property, should long since have proved that a prudent, practical management of a mine ought to be paramount in the minds of investors.

Mining, particularly coal mining, in many of the older states has reached a stage where the workings are spread out under a very large area, and in many instances they are not conducted in a systematic way. The artificial supports, principally timber, after a lapse of time, rot. They then produce a greater strain on the pillars or natural supports and every year involve greater risks. The accumulation of large bodies of gas in the old workings, the scientific ventilation of the mine—these are all grave questions that require the master mind of experience, and not the unskilled, incompetent men too often found in command.

TWO NOTABLE DISASTERS

It is a well-known fact that the large caves in the mine give warning according to the quality of the rock-roof, sometimes days, weeks, or even months before it caves. The breaking of the timber of artificial supports, the bursting and shooting of coal from the pillars, the noise made by the cracking and working of the rock-roof, are unmistakable evidences of what is sure to follow. This was the case in the Twin Shaft disaster, near Pittston, Pa., Many of the workmen predicted just what happened, yet on that fateful Sabbath morning in July, 1896, they bravely marched into the jaws of death. The Susquehanna sings its mournful requiem over their dead bodies lying entombed beneath thousands of tons of rock. A valuable mining property was wrecked by a management which was in quest of a cheap production.

In the case of the Braznell (Pa.) disaster, where a large number of miners lost their lives last December, a coroner's jury rendered a verdict of negligence and incompetency on the part of the mine foreman. What of the manager, whose duty it is to employ none but competent foremen? What of the mine inspector, whose sworn duty it is to see that no incompetents are entrusted with the care of lives and property?

NEW LEGISLATION NEEDED

The great disasters in mining in the past are only forerunners of what we may expect in the future, unless legislation be enacted that will change existing conditions, bring order out of chaos, and make imperative the practical examination of every man in charge of human life and mining property. The law should also define the duties of a mine inspector, and make his office something more than a sinecure to be used by political parties as a sort of football.

The duties of a mine inspector in the State of Pennsylvania consist in great measure of holding inquests, granting certificates to applicants for mine foremen who have a pull, writing essays on how an ambulance corps ought to be organized, compiling statistics that form the yearly report, and meddling in politics in order to retain office. The department might well be called "the bureau of inquests."

During the past year I was employed by the president of one of the largest anthracite coal companies in our state to examine into and report on the condition of many of its collieries The conditions were in many instances alarming, yet they were supposed to be under the watchful eye of the mine inspectors and the management. To-day the thousands employed in these different collieries are under the charge of a manager, who, neither by education nor practical experience, has any knowledge of the high responsibilities of his position. This is only an instance; scattered through the length and breadth of the mineral-producing states there are many others. In many of the coal mines, where explosions of gas are of frequent occurrence, old men who are incapacitated from doing other work are employed as fire bosses. Ordinary sense teaches that a man in a position of this kind, where mistakes mean loss of human life, ought to be intelligent and not over forty years of age, that the eye-sight may be keen.

The competent mine manager has no use for any such methods, nor has the mine inspector any terrors for him. In the even tenor of his everyday, practical way, he makes each day's work take care of all its burdens. He bears constantly in mind the responsibility resting on him in the protection of the lives of his workmen and the property of his employer. I know of no higher duty devolving on any body of men than this great question of human life. The man who toils in the bowels of the earth, earning his bread in the sweat of his brow, is a human being, not a serf, and is at least entitled to the honest enforcement of the law relating to his welfare in the performance of his dangerous duties.*

*Extract from Paper prepared for International Mining Congress, Milwaukee, June, 1900.

News from Nome—Mostly Bad.

Disease and Destitution Threatened—All the Claims Gone, but Still the Miners Come.

All kinds of reports are coming from Cape Nome, most of them extremely unfavorable. Official documents and private letters bear testimony to the state of affairs in the new mining camp that has seldom been equaled even in the wildest rushes of previous mining booms. Contagious diseases have set in, such as small-pox, and many of the eager gold hunters have been held up at sea without being allowed to land. On shore, typhoid has been raging, and other ailments produced by the climate have been rampant. Worse than this, it seems that the authorities have been unable to maintain law and order. Martial law was declared at one time, but in spite of the strictest surveillance on the part of the soldiers and others, murders were of daily occurrence, and all kinds of lawlessness prevailed, especially on the beach, where no regard whatever was paid to the rights of the original settlers. The portion of would-be miners to mining claims has been about twenty to one. More serious than the lack of mining claims to satisfy the enormous horde of new-comers has been the absence of adequate housing accommodations, and the startling likelihood that transportation facilities will not be sufficient to carry away the thousands of new-comers before the winter season sets in. Shipwrecks have been frequent, as might be expected when one considers the recklessness of captains and officials of the navigation companies.

The richness of the famous sands, it seems, is greatly overrated. In time there may be discoveries in the neighborhood which would furnish profitable employment for a portion of the spring's arrivals, but the vast majority of those who have rushed to the place are destined to return bitterly disappointed, probably broken in health, and certainly broken in pocketbook.

Captain Richards, commanding the revenue cutter Manning, has written to the Treasury Department about his observations at the beach. He reports that there are at least 10,000 persons on the beach with no prospect of securing a paying claim or of obtaining employment, except as carpenters or mechanics. "It appears impossible," he says, "for the vast throng that has been and is

being thrown into Nome by the big transportation companies, to find mines or work." Many of these people have but little more than their passage money and outfits, and depend upon finding gold to keep them alive after landing. It is feared that many will be stranded before the end of the season, with no means of getting away. The question of how they will survive the rigors of an Arctic winter is one that requires serious attention.

Another estimate says that at least 14,000 gold hunters had landed at Nome by June 18, and that not more than two-thirds of the number of vessels engaged in the trade had reached port on their first trips. Rumors were constantly circulated of all sorts of disaster to vessels which are known to have left San Francisco or Puget Sound, but were long overdue in arriving. A great scare was caused by the report that the big steamship Roanoke from Seattle had an epidemic of smallpox on board. After the vessel reached Nome, the passengers were retained on board while a searching investigation was made by the medical officer. For some days there was great anxiety on account of the non-appearance of the Garonne, one of the largest ships of the Pacific Coast. On June 18, the army transport Rosecrans, laden with commissary and quartermaster's supplies, was aground in the shallow part of Behring Sea, 200 miles from Nome and thirty miles from land. The brig Hunter of Seattle was a total wreck a few miles off Romansoff. The schooner Eclipse encountered heavy ice, and a big hole was stove in her hull.

Dr. George Newlands of Seattle has returned from Cape Nome, where he went on a pleasure trip, with testimony regarding the situation there which is calculated to discourage all persons still inclined to seek their fortunes at Nome.

"There are too many who go there," says Dr. Newlands, "entirely unprepared either for a stay of any length of time or for the hardships to be encountered. Too many of those who go to Alaska go with the intention of living off the miners' toil, either directly or indirectly. This is a very serious mistake. Any one going with the intention of going into business, unless he has an assured opening, or with simply a vague idea of working for some one after his arrival will take long chances of success. However, this should not discourage any one who is really in earnest and who goes to work intelligently and prepares for the conditions that exist. There is plenty of room for everyone and any one who goes prepared to work and gets a lay on a good claim will make money.

"The district as a mining country is all right, but the country tributary to the city of Nome is not developed enough to support the large number of non-miners. The population of Nome at the present time is not far from 22,500. In fact this may be considered a conservative estimate. About 3,000 wintered at Nome; about 3,000 more came down from Dawson, and fully enough more to make up the number have been brought in by the steamers. For the support of this population the miners are expected by most of those going in to furnish the money. As a matter of fact by far the greater part of the money now in circulation at Nome is that brought in by new arrivals. There is a very good hospital at Nome, although the accommodations are limited to about thirty patients. The attendance and treatment, however, are of the best."

A mild form of martial law was declared two days before Dr. Newlands left, on June 28. Very few restrictions are imposed, however, the principal one being the prohibition imposed on carrying firearms. Order is usually very good. Although one would expect such offenses as highway robbery, burglary, etc., to be common where there is so much gold, there is, in reality, very little of this kind of crime. Life and property are probably as safe as in most cities of the United States.

Here is the testimony of Harry Anthony, of Edmonton, who is one of the eager hunters for wealth at Nome:

"This is a country of great possibilities, but at present it is certainly overrated, and the number of people who were disappointed in the Klondike rush will not be a mark to those who will get left here. The beach diggings (which really made the camp) are about worked out.

"This is the most desolate country you can imagine. There is not a stick of timber closer than ninety miles, and the fuel question has been a hard one this winter. Driftwood was hauled as far as twelve or fourteen miles, and was sold from $35 to $60 per cord. I sold the house we bought up the beach, or rather the logs in it, for fifty cents per running foot, and the roof poles for seventy-five cents each. Provisions have been fairly reasonable, flour five dollars per fifty-pound sack; bacon, forty cents; canned meats, seventy-five cents per can; fruit, fifty cents per can, and everything else in proportion."

W. C. Ramseyer, formerly a Cripple Creek miner, has written home to one of his friends, dating his letter on board the Ohio, anchored one and a half miles from shore, June 11:

"The Ohio has just been quarantined for twenty-one days on account of smallpox, and don't know when we will be able to land, as new cases will continue to break out, so you see it is all off with us on the Ohio. We are a sorry looking lot of people to-day. The grub is nearly all rotten and it is costing me three dollars a day for decent food to eat. There is no one working on the beach. I can see the entire beach and advise everybody to stay away from Nome, as one-half the people are returning on the same boats they came on."

A Fanless Self-Cooling Water Tower.

In this age of progress and money saving devices, the ingenuity of man shows itself in many unexpected places. Not so very many years ago steam engines were run condensing only on shipboard, or along the banks of waterways, etc., so that only steam users thus located were able to take advantage of the manifold and manifest merits of a condensing system.

To the lay mind, the word "condensing" is more or less meaningless; but to the engineer and the payer of the coal and water bills it is an item that courts the most intelligent investigation. In the first steam engine, the condenser played one of the leading parts; in fact, the condensation was accomplished in the cylinder at each stroke, but the successful introduction of materials capable of standing higher pressures, together with the improvement in valve construction and manipulation, seemed to push the apparent economy of condensing to the rear, except in the cases mentioned above, where the circulating water was abundant.

A BARNARD-WHEELER SELF-COOLING WATER TOWER.

Let us see what there is in a condensing system to make it attractive to modern steam users who aim to get best returns for the money invested. Briefly, there are the following arguments in favor of exhausting under a vacuum, as against running high pressure or exhausting into the atmosphere:

1st. Increase of power with the same coal consumption or, conversely, decrease of fuel burned with same development of power.

2d. By the use of condensed steam for boiler feed purposes, a large saving in the water bill is effected, and the boilers supplied with water free from lime and scale-bearing impurities.

3d. Steam pressure may be reduced without loss of power in engines where boilers are showing age and where watchful inspectors are obdurate.

With these facts in mind, one may well ask, Why it is that all steam plants are not run condensing? The answer seems to be that people generally think it is out of the question except where plenty of circulating water is available.

For the benefit of those who are not so advantageously situated, attention might be called to a system devised by a New York engineering firm,

the Wheeler Condensing & Engineering Co. It is to the method of cooling the circulating water so that it may be used over and over again that their interest is directed.

For a considerable period the Wheeler company has been building and installing, with great success, the Barnard-Wheeler cooling tower, but despite the wide use of this device, they have evolved a cooling tower bringing into play all the desirable features of the original tower, but dispensing with the use of the fans for creating a draught, and consequently eliminating a constant source of expense, viz., the power necessary to run the fans.

The Barnard fanless self-cooling water tower is the result of years of study and costly experiment, the object in view having been to obtain maximum efficiency with minimum cost and space or ground area requirements. All mechanical means to circulate the air for cooling the water have been dispensed with. The water distribution system is unique in that provison has been made to operate parts of the tower, where variable loads are encountered, and also what is very essential, that repairs and cleansing do not entail a shut down. A gallery and ladder provide means of inspection at all times. The entire structure is braced against strains or exposure to wind pressures, insuring rigidity under all conditions. The average height is about thirty feet and the weight per square foot of foundation area is very low, thus allowing for roof installations where ground space is not available. The increased pump duty on a roof tower when used in conjunction with a Wheeler surface condenser is that due to the height of the tower solely, as the uptake and down columns balance below the tower tank.

A glance at the accompanying cut of a tower to care for 1,000-HP. and a few words of explanation will describe more in detail the construction. The hot circulating water, when discharged from the condenser, is pumped up through a central stand pipe, from which it is led to a trough and distribution pipes, which insure the constant flow of a thin film of water over the meshes of galvanized wire mats, which drain into a tank forming the foundation of the tower, and from whence the cooled water is returned for another trip to the condenser. The mats are entirely exposed to the atmosphere and are arranged in such a manner that the circulation of air is complete and the consequent evaporation carried far enough to reduce the temperature of the water to a sufficiently low point for good condensing purposes, a common reduction being from, say 135° to between 85° and 90°.

When it is remembered that this is accomplished simply by taking advantage of nature's functions, and without the use of anything costly, the magnitude and importance of this invention is strongly accented.

The field into which this device enters is almost boundless. In mining camps a furnace plant, shaft blower and lifting outfit, located usually in a rough, inaccessible country, where water and coal is hauled, or conveyed in some equally expensive manner, are practically compelled to run non-condensing, unless resort is made to the cooling device here described, when all the economy of a condensing system is gained at comparatively small cost. The use of the Barnard fanless tower simplifies matters greatly in power house location. To gain the benefits of condensing, power houses have hitherto been placed in out of the way places, necessitating long lines of wiring, liable to serious leaks, to say nothing of additional cost of copper feeders. With the introduction of the cooling tower, location becomes simply a question of expedience.

Artificial ice manufacturers have been forced to build on expensive water-front locations, in order to get the circulating water for their steam and ammonia condensers. With the advent of the cooling tower they may now locate their plants centrally and on property costing perhaps one-quarter that of the river front values.

In general, all steam users and owners who are interested in the latest and best equipment for their power needs will find in the Barnard fanless self-cooling water tower an article worthy of their most careful investigation.

The D. Van Nostrand Co.'s last monthly record of scientific literature contains announcements of several books of especial interest to mining men. Among them is William Hamilton Merritt's "Field Testing for Gold and Silver" and J. W. Anderson's "Prospector's Handbook." The selling price of each is $1.50.

Prospects of Copper Mining in Northern Wisconsin.

Geologically Identical with Keweenaw Point—Development Thus Far—A Region Full of Promise.

By Kirby Thomas, West Superior, Wis

Under the stimulus of high price and the prospect of an increasing demand for copper, the efforts to discover new workable copper deposits during the past two years have almost been equal in interest and geographical extent to the ever-continuing search after gold. Every favorable formation has been prospected for the red metal, and as a result, the production of copper hereafter will not be confined to a very few localities. One of the new copper districts which promises to come to the front very soon is the Western Lake Superior district, as the considerable area of Keweenawan or copper-bearing rocks in Northern Wisconsin is designed.

GEOLOGICAL FORMATION.

The Keweenawan formation, in which occurs the copper prospects in Northern Wisconsin, consists of a series of eruptive beds alternating with sandstones and conglomerates, and in its upper division almost wholly composed of detrital deposits interbedded with occasional lava flows. The formation lies above the Huronian rocks and below the Potsdam sandstone of the Cambrian period. The Keweenaw formation in the Lake stantially horizontal position at the bottom of the ancient sea. Subsequent earth movements tilted the beds so that they form a great trough or synclinal conforming in a general way to the present bed to Lake Superior. One edge of the synclinal forms Keweenaw Point, Mich., and extends westward across Northern Michigan and Northern Wisconsin, flattening out as it passes into Minnesota. The great Michigan copper mines occur on this edge on Keweenaw Point. At the western end of Lake Superior, both edges of the synclinal are represented by the upper St. Croix valley, which was formerly and until recently the outlet of the lake. The northern edge of the synclinal forms the Douglas Copper Range in Northwestern Wisconsin, the hills back of Duluth, Minn., and is exposed along the northwest shore of Lake Superior and on Isle Royal. The lower beds of the Keweenaw formation consist mainly of coarsely crystalline gabbros, from twenty to fifty feet thick. After four or five thousand feet of these flows had spread out in horizontal sheets over this Lake Superior region, the magmas became somewhat different in chemical character, the eruptions more frequent and thinner. These constitute the middle series of the Keweenaw formation and most of the copper mines are located in this division. The upper series consist of alternating-eruptives and sandstone or conglomerates.

IDENTITY WITH KEWEENAW POINT

The absolute identity of the formation in the western Lake Superior district with that in the Keweenaw Point region is proven by very eminent authorities. On page 139, Monograph V, Mr. Irving, referring to the identity of the eruptive rocks of the St. Croix (Wisconsin) district and the Keweenaw Point formation, says: "This identification is also indisputable; it is so because of the absolute identity in nature and structure of the rocks of the region, and because the Keweenaw belts have been followed continuously from the eastern end of Keweenaw Point, Michigan, to the St. Croix river, Wisconsin. The predominate fine-grained basic rocks of the two regions are so completely the same in mineral composition, even to the alteration-products that thin sections of rocks from the two districts placed side by side are not distinguishable from one another. The rocks of the two regions present precisely the same amygdaloidal, pseudo-amygdaloidal, and compact phases. The amygdules are made of the same minerals in both, associated in the same ways. Native copper occurs in the St. Croix valley in the same manner, and with the same associates, as on Keweenaw Point. The evidence for all the distance between Keweenaw Point and the St. Croix is just as strong as that ever appealed to prove the continuity of geological formations anywhere. From Keweenaw Point to the St. Croix, the formation has been traced mile by mile."

DEVELOPMENT STORY.

The significance of the establishing of the identity of the rocks of the western Lake Superior district with the Keweenaw Point formation gradually filtered down to the laity. The increasing reports of "copper finds" on the Douglas Range led to considerable prospecting, which commenced in earnest about three years ago. The showings were good. Then followed the usual boom and bubble. After some excitement and sorrow, the men who had holdings on the Douglas Range, in the St. Croix district and on the Minong Range as the exposure of the southern edge of the Keweenawan synclinal in Western Wisconsin is designated, settled down to the serious and hard task of opening up copper mines.

FACILITIES FOR MINING.

The whole district is within a few hours' ride of Superior, a considerable city with unexampled railroad and harbor facilities. Roads and railroads make the country easily accessible and solve in advance the important transportation problem. Wood and water and water power are abundant throughout the district. The exposures of the formation throughout Douglas county, Wisconsin, are frequent and prospecting is not difficult. However, a large part of the formation farther east is heavily drift covered. The copper occurs in the amygdaloidal, or porus portion of the beds which dip usually at a high angle. Consequently surface work and trenching is quite satisfactory in showing up a prospect.

The lands in the more favored localities in this district have been syndicated by local promoters, but well located lands can to-day be secured for from $5 to $10 an acre. The title of the lands in the district is all in individuals and the United States mining laws do not apply.

LOCAL DETAILS

On the Douglas Range four principal companies are developing to-day. The Chippewa Copper Mining Company, formerly the North Wisconsin, has a shaft on an ore chute down 200 feet and has done nearly 300 feet of drifting and cross-cutting. This company is controlled in Boston and is satisfactorily financed. The Percival mine has reached a depth of 190 feet and shows a good ore body. The Fond du Lac mine has so far confined its work to surface proving and with very satisfactory results. The company is endeavoring to secure money to sink deep shafts and prove the property. The Culligan company, which was one of the earliest discoveries on the range, has recently been reorganized and is now actively prosecuting development. The Copper Creek mine is also a very good property. A crew has been at work on this location all winter.

The St. Croix district, which is a practical continuation of the Douglas Range, has yielded very rich showings to the prospectors. The land on this range has been bought by the St. Croix Consolidated Mines Company, but as yet no development work has been done. On the Minong Range the only development work undertaken is in town 43, range 10, in the southeastern part of Douglas county. Here Mr. Frederick Weyerhauser, the wealthy lumberman, and some associates have opened up a very rich strike. The preliminary work of proving the property has been done and steps are now under way to install the machinery for actual mining. On both ranges there are many individual prospects of good promise.

SOME ASSAYS.

The Wisconsin Geological survey made a preliminary inspection of the district last summer. The assays made for the survey from average samples was as high as four per cent in native copper. An average sample from the Culligan assayed 4.19 per cent. Average samples from the Fond du Lac gave .39, 1.99, 1.25, 1.37 and 1.21 per cent respectively. Copper Creek samples gave from .29 per cent to 1.60 per cent. The Weyerhauser, which was not examined by the survey, yields nugget copper weighing several pounds. In this connection it should be considered that the Michigan mines give seemingly low percentages, yet are profitable because of the conditions and extent of the ore deposits. The Atlantic mine on Keweenaw Point is paying dividends on an average yield of less than .6 of one per cent rock.

CONCLUSION.

The western Lake Superior district will soon be adding to the world's copper supply. The geological conditions and the prospects actually discovered and proved give reason to believe that the district will yet and soon develop several copper mines, and it may rank along with the Michigan district world-famed for the richness of its copper mines.*

*Extract from Paper prepared for International Mining Congress, Milwaukee, June, 1900.

Why Women Should Become Interested in Mining.

A New Field for Women—Conspicious Examples of Success—Advantages of Gold Mining.

By Mrs. E. C. Atwood, Empire, Colo.

Mining is an industry that offers an excellent opportunity to women who are anxious to earn money, and at the same time be actively and interestingly engaged in a suitable, most fascinating, and lucrative occupation. It is a business that can be made to pay by any energetic woman who will pursue it in an intelligent and painstaking way. The work is not easy, but it is elevating, educational, and pleasant, and many women have not only made a success in mining, but have risen to the highest pinnacle as experts in the profession. As evidence of the truth of this, I have only to refer to the business career of the expert in metallurgy, Miss Caroline Van Brunt, who to-day is one of the most conspicuous examples in America, and perhaps in the world. She is not only the secretary of the Orford Copper Company, but is a director, and one of the incorporators of the company, and knows more about copper, nickel, the general mining of ores, the source of supply, production, consumption, tariff, state of trade, etc., than any other woman in the United States, and probably more than three-quarters of the men claiming to be experts on the subject of mining and all its kindred interests.

Miss Van Brunt has closely studied the problem of rendering copper fumes innocuous, and it was largely due to her ingenious and intelligent presentation of her side of the question that Congress was induced to give those establishments requiring it a chance to experiment further with patent smoke-consumers and odor-extractors.

In Colorado we have two women who have brought success and wealth to a company that had been a loser from the start. I refer to Miss Stewart and Miss Dillingham, who are well known as successful managers of a mine and concentrating mill.

Mrs. E. C. Stoiber of Silverton is another successful mining woman. She is a member of the American Institute of Mining Engineers.

When men taught school, and women did not, "teacher" was a masculine noun; now it stands nine to one feminine in America. "Doctor" Jones no longer conveys instant assurance of masculinity. We are learning by continued contact with established facts to recognize that racial functions are one thing, and sex functions quite another; and the essential activities of organized society are human, and neither male nor female.

UNIQUE CONDITIONS OF GOLD MINING.

All mining is a desirable occupation, but gold mining is the one form now unaffected by trusts, trade combinations, or even the law of competition or business rivalry. It occupies the unique position among the industries of the world of being the one form of production where there is no "overproduction" or "want of consumption," where the same price in the bar prevails as thirty years ago, and where conditions make it impossible for any combination to control its price or volume of output. Gold is the ruling power and its viceroy is coin. Its plentiful production increases the product of every other class of mining, as well as the products of the field, farm, and orchard. There is no industry, no profession, no trade or calling in life that is not the better for it. In its advancement, you compete with none, you injure none, but on the contrary, greatly promote the welfare and happiness of all. I cannot but feel from my seven years' experience in active mining that if women would only investigate for themselves, and not be guided by false advice, especially from those who have been unfortunate through their own mismanagement, they would grasp with enthusiastic avidity the great opportunities mining presents to them for quickly accumulating wealth in a legitimate manner from the hand of nature.

DANGER OF SPECULATION.

In speaking thus of mining, however, don't misunderstand me. I refer not to speculation in mining stocks, but to legitimate business operations in the industry of mining, recognizing the question of stock investments alone as the merchant does on the profit and loss page of his ledger.

The blind multi-millionaire merchant of New York City, Mr. Charles Broadway Rouss, says in giving financial advice to women: "There is one thing I would most emphatically impress upon women—keep away from Wall street. Don't speculate; don't buy stocks. That is not legitimate business, and is sure, sooner or later, to lead to ruin. Aside from that, there is no line of business in which women may not succeed if they will give to their work the necessary thought and attention."

In speaking for myself, in my experience of several years as a stock broker, I must confirm what Mr. Rouss so forcibly proclaims, and further say that stock speculations have destroyed more homes, caused more bank defalcations, broken more hearts, and passed into the whirlpool of misery and disgrace more human beings than any other evil to which men or women are exposed.

Col. Charles E. Fuller, the oldest member of the Boston Stock Exchange, told me that in the forty-two years' experience on the floor of that exchange, he never knew of but one man, who was a regular speculator, to succeed. The man was the son-in-law of the late Gov. Ames of Massachusetts, and he never bought stocks, but sold them "short."

Whatever theories we may learn, whatever useful information we may gain, and whatever natural or other advantages we may possess, avail us nothing unless we utilize them. I wish I had the power to picture to the American women entering the business world, the purity, the freedom, and the glorlousness of living close to nature. I wish I could make her realize that in seeking a field of usefulness in which to display her ability among the working bees of society, there is none more healthful, more attractive, more useful, and successful, than mining. In the open air, working and resting under the sunbeams of Heaven, she will find the health, strength and happiness that will best fit her, not only for a successful career in the business world, but for the better discharge of her domestic duties.*

The Tremain Steam Stamp Mill.

About six years ago the Gates Iron Works of Chicago acquired exclusive right to manufacture Tremain Steam Stamp Mills, and since then this specialty has been widely introduced, and has become generally recognized as one of the most important machines used in the reduction of ores. Even the enormous resources of the Gates plant have been at times unequal to the demands of importunate buyers, but a recent enlargement of the "Tremain Mill Department" enables the company to announce that future orders will be filled with despatch. The accompanying illustration shows a number of the mills in various stages of completion. Another half-tone engraving shows an installation of the Tremain Mills at the Regina Gold Mine, concerning which the secretary officially reported to the stockholders as follows: "Our reduction plant consists of a bottom of eight Tremain Steam Stamps Mills, equal to forty heads of gravity stamps. It was only after great discussion and anxiety on this point that your board decided on adopting Tremain Mills, and they are glad to report to you that they are working most satisfactorily."

Stamp mills present many points of possible weakness, and the manufacturers of the Tremain Mill summarize the superiority of their product under nineteen heads, as follows:

1st. It requires no engine, shafting, pulleys, belting, cogwheels, cams, or tappets in its operation.

2d. Being operated by direct steam—an extremely elastic fluid—there is less friction and no concussions except between the shoes and dies.

3d. Not depending upon cams for raising, or gravity in dropping, the speed and capacity per stamp are more than doubled.

4th. It therefore accomplishes as much work as a battery of five ordinary stamps which costs much more.

ASSEMBLING TREMAIN STAMP MILLS.

*Extract from Paper prepared for International Mining Congress, Milwaukee, June, 1900.

6th. One experienced workman per shift can operate the entire plant.

6th. All lubrication is accomplished through one sight feed lubricator, using a minimum amount of oil.

7th. It can be erected in less time and for less money than any other mill.

8th. It is entirely self-contained, requiring no framework in its erection other than a mortar block.

9th. It has no superior as amalgamator.

10th. It has larger screening capacity and quicker issue than any other stamp mill.

11th. It produces less slimes than any other mill.

12th. Concentration is easier to accomplish after the Tremain Mill than after any other machine.

13th. It may be operated under a simple shed, in a log building, or entirely independent of any building.

14th. It weighs less, is extremely portable, can be moved in less time and for less money than any other mill.

15th. The cash represented by the abandoned

BATTERY OF TREMAIN MILLS AT REGINA GOLD MINE

foundations and building is but a small fraction of what is left in moving any other stamp mill.

16th. It can be erected and put in operation in a few days, after which a building to suit the climate can be put up without interfering with the operation of the mill.

17. Additional capacity can be quickly and economically added to the milling plant.

18th. It uses the steam expansively and is very economical in the use of fuel.

19th. It is the ideal prospector's mill, and its use will enable the quartz miner to provide a complete milling outfit for development or permanent works at from one-half to one-tenth of the initial expenditure required for any other ore milling plant of equal capacity.

The Evils of Promoting.

By N. C. Westfield, St. Paul, Minn.

The business of gold mining in the past has been one of crude and primitive methods. Chemistry has done much to improve these methods, and to reveal how little we know of the simple laws of nature. A few years ago we were, in many instances, leaving as much gold in our tailings as we were extracting. To-day many of the old dumps are being worked over at a splendid profit, and the business is on the eve of the greatest progress it has ever known.

Gold mining is only in the morning of its splendid future. Through its scientific departments it is becoming, not merely one of the safest, but absolutely the safest business to-day seeking the investment of capital.

There is, however, a vast difference between the business of mining and the business of promoting and organizing companies. This difference is not understood by people generally. Just so long as promoters are able to organize companies and sell sufficient treasury shares to do a little development work—just enough, in fact, to boom the shares and enable the promoter to dispose of his own shares which have probably cost him only a few cents—just so long will there exist a strong prejudice against the business of mining.

When a promotor is left free to do what he likes with his shares there is a great incentive for him to sell out. And this has become a business within itself. In disposing of this stock he sells to many different people, and no one person feels like taking hold to carry the business on after the promoter sells out; thus a company has been formed, a lot of people have been bled, and a wily promoter has been made rich.

The question may be asked, "Who is to blame?" Certainly the persons who bought the stock are not to blame for the glowing reports of the richness of the property. They, on doubt, anticipated the profit to be derived from a legitimate deal.

Investors, however, are to blame for not having the shares of the promoter securely tied up. If this had been required in the outset, the probabilities are that no company would have been formed, for the simple reason that the promoter in all probability never had any idea of doing actual mining, no more, at least, than would give value to the shares long enough for him to unload.

A real live promoter can get out the finest prospectus, giving the most wonderful account of the richness of his property (whether he has any property or not) and make it so plain that people seem to fall over themselves to buy his shares. This is, in fact, the reason why a legitimate enterprise often goes begging: an honest man will tell only the truth about his property, and when his prospectus is compared with that of the imaginative promoter, it seems very tame.

I hope to see the day when it will be impossible for any man to organize a company and slip through the meshes of justice after he has robbed a lot of innocent though ignorant shareholders. This will not be accomplished by enacting laws to curb the questionable tactics of the polished promoter, but by an educational crusade upon the part of investors, who, armed with the facts, will not be so easily duped.

In organizing a company for the purpose of engaging in the business of mining, there is but one rule that should be strictly followed, and that is this: The investors should see to it that there is no possible way for a promoter to make one dollar except through the development of the property owned. If stock is issued to him, it should be securely held by some reliable trustee under a contract that absolutely prohibits any dealing with the shares until the company has disposed of sufficient treasury shares to place it upon a basis absolutely self-sustaining, and, in fact, until the company is ready to begin the payment of dividends.

Why should an honest man object to this plan? Does the investor who purchases treasury shares have anything like the same privilege? Is he not, in fact, carrying the load, and is not the promoter, if he sells out, covering at the expense of the investor?

No business is more profitable and legitimate than that of gold mining when conducted upon honest lines, where every man is forced to stand up to the rack and the promoter is prevented from competing with the treasury of his company.*

Mines and Minerals of Southern Wisconsin.

Early History—Forms of Lead and Pyrites—Galena and Trenton Limestones—Two Commercial Chances.

By Richard Kennedy, Highland, Wis

Prior to the year 1815 little is known of the lead and zinc region of Wisconsin. At that early date the Indians possessed a number of furnaces which they managed in their unskillful manner.

Between the years 1815 and 1820 Col. Shaw made eight trips from St. Louis to Prairie du Chien, visiting the lead mines at Galena and at one time carried away seventy tons of lead. Julian Du Bugue explored the lead region of the Upper Mississippi in 1786, and two years afterwards was given permission by the Indians to work the mines.

In 1766 Capt. John Carver visited the Blue Mounds and speaks of lead as abounding there at Sauk Prairie. He said it was so plentiful that large quantities could be seen about the streets in the town belonging to the Saukies.

The lead trade began to attract attention in 1822, and Mr. Jas. Johnson, a government contractor for the army, made a treaty with the Indians, and obtained permission to work the mines He let in other parties, and one firm named Stare brought from fifty to 400 negro slaves to work the mines. The government first granted leases in 1823. This was followed by a great rush of miners to Galena, somewhat similar to the California excitement in '49.

STRUCTURE OF LEAD AND PYRITE.

Lead or galena is a simple compound of lead and sulphur in the ratio of 86.6 to 13.4. It is rarely free from foreign substances, but in this region attains a high degree of purity, and is the highest grade of soft lead. All galena is more or less silver-bearing, but the Wisconsin lead is almost free from that material. It crystallizes in its fundamental form, the cube, and also in the octahedral form. The corners of the cube are often truncated by the faces of the octahedron, thus producing a combination of the two forms. The cubes are often large and clustered and are then graphically designated as "cog mineral." The smaller cubes are called "dice mineral." An interesting crystalline form of the mineral is known as reticulated galena. The faces of the crystal are not solid, but are formed of alternate plates and spaces parallel to the exterior, or of bands lying in the axes of the crystal, the remainder of the interior occupied by angular spaces. It is presumed that the material along the axes had the power of resisting the decomposing agent for a longer time than the rest of the crystal.

Pyrite, or as it is commonly known among the miners as "sulphur," is composed of 46.7 parts of iron to 53.3 parts of sulphur and has a bright, brassy color and metallic luster. It crystallizes in the isometric system and takes a number of modified forms. Usually it appears in aggregations where the forms of several individual crystals are constrained by one another. The crystals are often flat and present a crest-like appearance.

In selecting a home for metallic ores and useful minerals, nature generally chooses one which bears evidence of sudden disturbances or violent dynamic action. In the ore fields of southwest Wisconsin, the effects of dynamic agencies are absent. Faults and dislocations are entirely absent, the only irregularities being the undulations of the strata which produce slight changes from the normal dip. The main lead-bearing formation consists of a stratum of magnesia limestone about 250 feet thick. This bed lies nearly horizontal and forms the topmost rock throughout the region. It is a dolomite rock, known as the Galena limestone. When somewhat decomposed it assumes a crystallized granular form and often presents a sandy appearance.

GEOLOGY OF THE REGION.

The great majority of the lodes assume an east and west direction, while a number take a north and south direction. The two systems are

*Extract from Paper prepared for International Mining Congress, Milwaukee, June, 1900.

often combined, and when this occurs, the easts and wests are generally the more open and stronger ranges; they are usually the master ranges, while the norths and souths can be considered as tributaries or feeders. The order is sometimes reversed, the norths and souths being the master range. Besides these two systems, there is a third that is often important called quarterings. They have a northeast and southwest or a northwest and southeast direction.

Most of the lead and zinc mines in Wisconsin lie mainly in the Galena and Trenton limestones. There is no sharp line of distinction between them and the ore sheets traverse both. In passing from the Galena to the Trenton there is no separation of the lodes, but there is a change in the form of the ore receptacle and of the deposit. The ores in the upper Galena are found almost exclusively in vertical fissures, or in their enlargements known as openings. In the lower Galena there is a tendency to flats and pitches, while flats are predominant in the Trenton layers. A fissure often opens for a space along its course and again closes forming a gash-like opening. When filled with ore it is called a gash vein.

SULPHURIC ACID POSSIBILITIES.

The lead and zinc district of Wisconsin comprises an area fifty miles long by thirty miles wide, and contains numberless ranges, the greater portion of which are not yet developed. These ranges are continuous and run for miles.

Richly supplied with lead and zinc ores, southwest Wisconsin possesses the materials for still other industries. Chief among these is the manufacture of sulphuric acid. Throughout the district there are large deposits of iron pyrites which contain from 45 to 52 per cent of sulphur. In addition to this 33 per cent of all the blende is sulphur, thus making the supply almost inexhaustible.

In 1885, 85,000 tons of sulphuric acid supplied the demand for the United States. In 1898, 1,300,000 tons were required for different purposes in the same country. Of this amount ½ was used in the manufacture of a common household article—kerosene—35 per cent of the amount was used in the manufacture of fertilizing material from phosphate rocks. The remaining 15 per cent was used in the arts in galvanizing iron and steel, manufacturing dynamite, and many other purposes.

Sulphuric acid is the basis of all chemistry, and many and varied are its uses. But 10 per cent of the raw material used in the manufacture of this amount of acid was obtained in the United States. The remaining 90 per cent was imported from foreign countries. During the past few years larger quantities of iron pyrite have been used, and in a short time it is to be hoped that the United States will furnish the raw material for the manufacture of its own acid.

Hand in hand with the manufacturing of sulphuric acid is the making of fertilizing material. it is a well-known fact that calcium is a necessary element for the growth of all cereals. Gypsum or calcium sulphate is mined for that purpose in Michigan and in Iowa. In the blue limestone of the Trenton group the lead and zinc region possesses the purest of limestones, which, if treated with sulphuric acid, will make a fertilizer that in the near future will be in as great demand as the noted phosphate fertilizer of the South.

It has been proved beyond a doubt that deposits of ore lie below the oil rock, which was supposed to be the limit of the ore-bearing strata. At Benton, in the Ida and in the Ollie Bell mines large deposits of zinc have been found below the oil rock. At Ridgeway, lead has been mined in the St. Peter's sandstone and in the lower magnesia. This, together with the proof of lead being found in the lower magnesia at Highland, is conclusive evidence of a bright future for this district. With the advent of deeper mining and the development of the existing ranges, Wisconsin is destined to become an important factor in the world's production of lead and zinc.*

The Mining Congress at Milwaukee.

The sessions of the International Congress at Milwaukee were held from June 19 to 23. In many respects the convention was not what it should have been or what its promoters had intended to make it. A number of causes contributed to this situation. Several of the sessions were less harmonious than they might have been, owing to the conflicting interests of the various state delegations, and much time was lost in quibbling over unimportant matters, while the more important subjects of consideration received less treatment than they deserved.

B. F. Montgomery, of Colorado Springs, called the congress to order at 2.30 o'clock on the afternoon of Tuesday, June 19. The programme originally planned was not carried out in all respects, but the sessions were continued throughout the week. The evenings were given up to excursions and sociable gatherings, and interesting visits were made to the big shops of the Edward P. Allis Co. Abstracts from the best papers read at the congress appear elsewhere in this issue. It is a matter for regret that several of the speakers who had been advertised were unable to appear. At the Thursday session a discussion arose as to the representation to which various states were entitled in the congress. There was also talk about the establishment of a permanent organization.

The proceedings of the congress furnished conclusive proof in the minds of most of the delegates that a more permanent organization must be formed if the institution is to accomplish any considerable good for the mining interests of the country.

At the closing session, held on Friday, Boise City, Idaho, was selected as the meeting place for next year, and the following officers were chosen: President, L. Bradford Prince, Santa Fe, N. Mex.; vice-president, A. T. Swineford, Alaska; secretary, H. M. Ryan, Colorado; treasurer, Mrs. E. C. Atwood, Colorado Springs. Executive Committee: J. W. Adams, Dahlonega, Ga.; Mrs. Haskel, Helena, Mont.; Judge Filo E. Orton, Darlington, Wis. A permanent organization was effected by the adoption of a report from a committee appointed to consider the subject. No provision was made, however, for incorporation, although steps will be taken toward this end before next year's meeting. The report provided that the name of the organization should remain the International Mining Congress, with its objects—"the fostering of fraternal relations among those engaged in mining and kindred pursuits, the advancement of mining interests, the improvement of mining laws," and similar aims. The membership is to be made up of representatives appointed by state executives and authorized organizations, and of individuals interested in mining, who shall pay the annual dues of $5.

Queen & Co. of Philadelphia, Pa., were successful bidders recently for several nautical instruments for which figures were asked by the United States Naval Department, securing the orders for three instruments for use at the League Island Navy Yard.

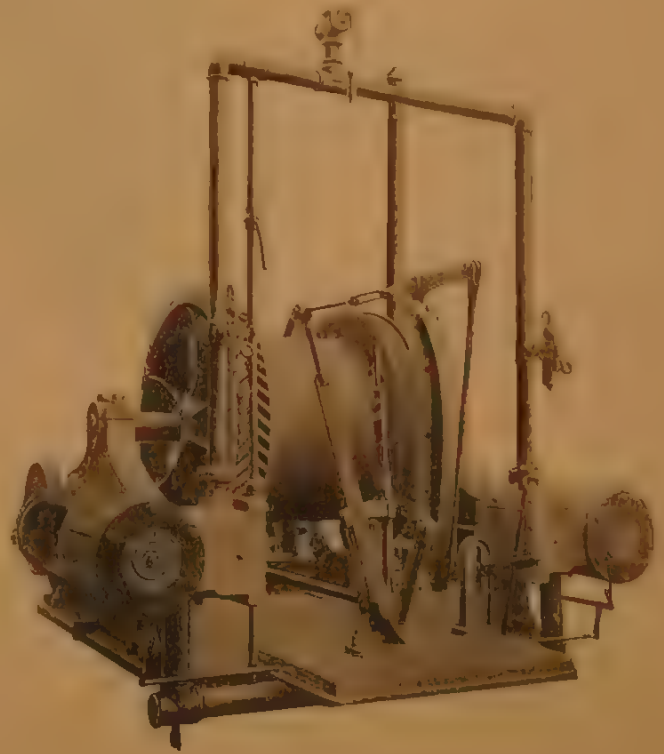
The Thriving Town of Bisbee.

Bisbee is now enjoying a period of the most gratifying prosperity. C. E. Tyler, a resident of the town, was recently quoted on this subject, saying: "The 1,400 miners employed in Bisbee receive in the neighborhood of $150,000 a month in wages. This large amount of money released in circulation every thirty days means something to a town of 6,000 or 7,000 people such as Bisbee is. The Lowell mine and the South Bisbee Mining Co. are getting good copper leads. Calumet and Hecla, owners of the Lake Superior property, who recently paid $600,000, so it is said, for some of Martin Costello's property, are likewise going to do a good business. Bisbee copper goes as low as seven per cent. The big mine is the Copper Queen, owned by Phelps, Dodge & Co. This property has about 150 miles of tunnel and 100 miles of railroad underground. It is estimated that the company has enough ore in sight for the next fifty years, which is a big thing in itself. The beautiful feature of the underground work was the opening of several caves. In one of these the Masonic conclave for Arizona was held several years ago. The natural interior arrangement of the cave made it an ideal place for secret lodge work, the beauties of the ceremonies being heightened by the electrical illumination arranged especially for the occasion."

The New Hendy Hoister.

The Joshua Hendy Machine Works of San Francisco, Cal., is at present making a number of sales of its new and superior design 8½ × 10 double cylinder single drum hoists. Through the courtesy of the company, we are enabled to present herewith an illustration of this hoist. The hoist has certain features of construction to which the builders are able to trace the reputation these engines have secured in the short time they have been on the market. The hoist is mounted on a single solid base with standboard for the operator. The engines are reversible link motion, and the drum is fitted with post breaks, which are sure, quick and safe in operation. Their compactness in design and the substantial and strong construction are particularly commendable. For severe and continued service, experience has shown them to be unequaled.

The columnar indicator is also a feature of the hoist, although the manufacturers will furnish dial indicators if preferred. Clutch pinions are furnished as the purchaser may desire. The pinions are helical steel, thereby obviating vibra-



A HENDY DOUBLE-CYLINDER SINGLE-DRUM HOIST.

*Extract from Paper prepared for International Mining Congress, Milwaukee, June, 1900.

tion and at the same time lessening the likelihood of breakage. A better idea of the engine can be obtained from noting the following dimensions, which are for the 8½ × 10 hoist, 45-HP.: Diameter of drum, thirty-two inches, diameter of flanges, forty-four inches; length of drum between flanges, twenty-four inches; diameter of drum shaft, 4¾ inches; diameter of crank shaft, four inches; weight of hoister, single rope, usual speed, 8,000 pounds; approximate shipping weight, 8,750 pounds; floor space required, 88 × 92 inches.

Smaller engines of from five to seven inch cylinders, having cut gears and pinions can also be seen at the warerooms of the Joshua Hendy Machine Works in San Francisco. The company also shows a large variety of double drum hoists.

The Cleveland-Cliffs Golden Anniversary.

On July 14 the Cleveland-Cliffs Co. of Ishpeming, Mich., celebrated the fiftieth anniversary of the commencement of its mining operations. The occasion was made a holiday in the mines. The exercises served to bring out much interesting historical matter about this interesting mine, which deserves permanent record. Since the company began shipping ore in 1856, it has sent to market 10,941,548 gross tons of iron ore. The present year will add to this figure enough to make the total at least 12,000,000 tons. It has been estimated that if this ore were smelted into a steel rail of ordinary weight, the rail would have a length of about 40,000 miles. The company's landed possessions exceed those of any other mining organization in the iron ore business, consisting of about 125,000 acres. Much of this is already located and has been worked, but a large territory is yet to be explored. The property also includes much valuable timber land. It is said that the Cleveland-Cliffs Co. is the only one in the Michigan district that reduces any portion of its ores locally. The old Pioneer furnace owned by the company made the first iron from the Lake Superior region in 1858. The Pioneer furnace was operated until the new stack was ready in Gladstone in 1896. This furnace has a capacity of 125 tons of pig iron daily. Besides the iron, the company operates a chemical plant for the securing of by-products, making large quantities of wood alcohol and gray acetate of lime.

The company's original pay roll showed seventy-seven names. The pay roll for June, 1900, bore 1,700 names of men who had worked throughout the month. The old books showed that the average wages of the men in 1856 was $1 a day. In 1861, the average was $1.16. In June of this year, the average wage was double that of the fifties. The company owns a handsome group of dwelling houses, which are occupied by its employees, and it has a reputation for being especially watchful over the interests of its men and their families.

The Board of Directors consist of Wm. G. Mather, president; J. H. Wade, E. R. Perkins, Samuel Mather, J. H. McBride, Samuel E. Williamson, W. S. Tyler, H. J. Hoyt and Peter White.

Judge Ross' Oil Land Decision.

An erroneous impression has been created by the publication of a statement, not long since, concerning Judge Ross' decision in the United States Circuit Court regarding the location of a tract of government land by parties holding scrip, and subsequently located as a petroleum placer mining claim by other parties. The decision has been construed as declaring that scrip land claims take precedence over mineral claims. As a matter of fact, scrip land claims do not take precedence over mineral land claims, nor does Judge Ross' decision declare anything of the kind.

The case in question was that of the Olive Land and Development Co. vs. William H. Olmstead and others. It was alleged by the complainants that they acquired the land of their predecessor, J. H. Johnston, who obtained it through ownership of government scrip; that subsequently in October, 1899, the claim was located as a petroleum placer mining claim in the name of La Bonita Oil Claim. These locators, eight in number, prior to May 22, 1900, had conveyed the claim to the defendants.

The court, in passing upon the arguments, stated that as the case was the first of the several scrip land-oil claim cases to come before the courts with any likelihood of a decision, and as the case would probably be used hereafter as a precedent; and to further as much as possible the valuable industry, he had given the matter much thought and had advanced it upon the calender that it might be finally settled as soon as possible.

The court affirmed: "The settling upon the land as an agricultural claim was sufficient to hold it, even though later others should come along and oust the settler by putting up monuments and laying claim to the land as a mineral claim."

There is nothing in this declaration that says scrip land claims take precedence over mineral land claims. If the conditions had been reversed, the mineral claimant making a valid location first, the decision would have been reversed, probably bringing forth the statement that mineral land claims take precedence over scrip land claims.

A decree was entered in favor of the complainants, with, however, a provision to the effect that should the land department of the government at any time prior to the issuance of a patent for the selected tract, determine that the land was not vacant and open to settlement at the time of its selection, the operation of the decree should thereupon cease.

It must be understood that if a mineral claim is valid and all of the requirements of law are complied with, no other claim can supercede it. Scrip cannot select mineral land as the law states, but it must be shown and proven first that it is mineral land before one can prevent the scrippers from selecting any piece of land, and in fact, before any one can claim it as mineral land and hold it. According to a previous decision of the same court an oil well must be sunk and oil actually discovered upon the ground before it can be held as petroleum placer mining ground. Seepages or other indications do not count.

An Automatic Lubricator.

We show herewith, through the courtesy of the makers, a cut of a lubricator designed to be attached to any reciprocating or oscillating parts of engines, or machinery requiring constant and reliable lubrication as the crossheads, connecting rods or eccentric straps of engines, pumps, and air compressors. As it feeds grease instead of oil, it may be attached in any position desired, feeding vertically upward or downward, horizontally or at any angle desired. It feeds only when the part to which it is attached is in motion, and no feeding or loss can occur after the motion ceases.

The base of the lubricator is screwed firmly into the part to be lubricated in the usual way. The body is attached to the base by the union nut or enlarged ring at the top. When this is unscrewed the upper part is all taken off together, the barrel is filled with a charge of grease and returned and securely clamped in the position again by the union nut. The feeding is accomplished by the pressure of the piston, and this pressure is applied by the vibrations of the pendulum seen in front. By the adjustment of the stopscrews at the side, the pawl attached to the pendulum may be made to take from one to six or more teeth of the ratchet wheel for each vibration. On the ratchet wheel shaft is a worm which meshes into the large worm wheel at the top. The central screw or spindle is splined and revolves with this wheel at the same time that it travels downward by the operation of its thread in the central nut, which is screwed into the bracket or guide at the top. The feeding goes on if the vibration continues until the piston reaches the bottom and the grease is all expelled. To raise the piston for refilling the barrel the central nut which has a milled and notched head is unscrewed from the bracket the piston is pulled up, the nut is whirled down the screw by hand and screwed tight in its place again. The ratchet wheel may be pulled around by hand until the slack is taken up and feed is fully established, and if at any time it is desirable to feed in an extra quantity of grease, this also may be done by turning the ratchet wheel.

The lubricator may be made of any size and for any rate of feed desired. The one here shown will hold about fourteen cubic inches or somewhat less than half a pint of grease. The ratchet wheel has 100 teeth, the spindle wheel has 125 teeth, the central spindle is twenty-four threads to the inch, and the travel of the piston is three and one-half inches. If, then, the pendulum is set to take two teeth of the ratchet wheel for each stroke, the number of strokes required to empty the barrel will be 525,000, and at 200 strokes a minute this would last 2,625 minutes or say forty-five hours. Any of the usual kinds of grease may be used in the lubricator, and any percentage of pure graphite may be mixed with it. The worm is of steel and the pawls are of steel hardened and the wheels are of hard bronze. The lubricator was designed and patented by G. U. Merrill, of Paterson, N. J., and is made and sold by Jas. L. Robertson & Sons, 228 Fulton st., N. Y., who are distributing without charge an interesting pamphlet describing the device.

The Year With Calumet and Hecla.

The Calumet and Hecla Mining Co. has just issued its annual report. As usual, the document is of considerable interest and shows a most prosperous state of affairs in this famous mine. The production figures for the last five years are shown to be as follows: 1895-6, 42,776 tons refined copper; 1896-7, 46,237 tons; 1897-8, 45,191 tons; 1898-9, 44,450 tons; 1899-1900, 49,312 tons. President Agassiz says in the report:

There have been paid during the past fiscal year four dividends of $20 each. We have, as in the previous year, continued to push the openings underground both in the conglomerate and in the Osceola amygdaloid belt. I ought to state that the marked improvements noted last year in the character of the conglomerate lode at the south end of the mine has not continued, and that the lode at the north end of the mine in the lower levels is not as rich as in the upper ones, or in the central part of the mine, the quality of which has not changed.

On the Osceola lode we have now reached a depth of over 1,300 feet in the No. 13 shaft, and have since last year opened No. 16 and 17 on the Osceola, giving us a length of over 9,000 feet on that belt. We have continued to stamp amygdaloid rock with one head supplied principally from the openings, and from a very limited stretch of stoping ground near No. 15. During the past year we have built sixty dwelling houses for the use of our employes. Half of our second coal dock, of a capacity of 100,000 tons, has been erected at Torch Lake; the whole dock should be in commission this fall.

The foundations have been laid for an extension of the Hecla mill. It will contain six heads, and should treat 2,500 tons of amygdaloid rock a day. Four boilers have been added to the mill plant. The experiments which have been making at the mills, with a view of diminishing the loss of copper carried off in the waste sands, have resulted in equipping one of the heads with washing machines differing from those generally in use in the Lake Superior district. The results obtained thus far are satisfactory. The Hecla & Torch Lake Railroad has been extended to the head of Torch Lake, where we intend to erect a timber mill during the summer. We have purchased a tract of timber land near Whitefish Point.

At the Lake Linden smelting works a new mineral house has been erected, also an addition to the boiler-house has been equipped with two boilers, and the machine shop has been remodeled. We have also built a new tram line for loading the mineral intended for the Buffalo smelting works. At the Buffalo Smelting Works we have purchased an adjoining parcel of land, and are building an electrolytic plant for the treatment of a certain portion of our product, including that which carries the larger values in silver. We have also erected a double furnace with a Walker table, from which we hope to ob-

tain a great increase in the rapidity of casting our copper. We have also built an electric conveyor for loading the furnaces, and have made a contract for the purchase of an additional frontage on Niagara River. Our original lot is now entirely covered with buildings, and we shall need the additional land for future extensions of the plant. In consequence of the continued high price of copper, we have continued the increased production of the previous year. The expenditures on account of the aid fund for the fiscal year amounted to $60,903.30. The value of the aid fund at cost is $151,529.99. As in the past year, we have continued to pay the contributions of the men to the aid fund.

Butte's Rich Mines.

Reports have been received from the various mining companies of Butte concerning their net proceeds for the past year. Last year's totals are enormous as compared with the records for the preceding years, as will be shown from the following table:

1900	$13,856,270
1899	8,159,645
1898	7,698,540
1897	7,749,910
1896	3,634,595
Total for five years	$41,089,490

The total returns for the six principal mining companies during the same period were:

Anaconda	$18,346,250
Boston & Montana	17,696,110
Parrot	2,116,970
Montana Ore Purchasing Co.	1,411,800
W. A. Clark's properties	557,220
*Butte & Boston	668,205

*No reports for 1899, 1898, 1897.

Other interesting testimony showing the relative standing of the companies is contained in the table giving the amounts of taxes paid on the net earnings during the last four years. The Anaconda leads with $207,496.02; next comes the Boston & Montana with $184,421.27; then the Montana Ore Purchasing Co. with $12,139.16, and lastly the Clark properties with $3,729.44.

The Gold Fields of the Yaquis.

Charles Erickson and Harry Tharoldson, both of New York, who have been prospecting in the Mexican mountains for two or three years, have returned to the United States claiming that they have located the famous gold fields of the Yaqui Indians. When in Phoenix recently, they exhibited large quantities of gold taken from placer fields at some point along the southern side of the Sierra Madre range, in the lower portion of Chihuahua, or the northern part of the state of Durango. They would not tell just where their riches came from, but said, wisely, that there was plenty more gold in the same place, although it was carefully guarded by the Yaquis. They estimate that they have about $18,000 in dust.

About the middle of May, so they say, they saw traces of gold in the small streams which they followed up into the hills. While washing out the dust in good quantities, they were attacked by a party of Indians. Fortunately they were well armed, and for two days they successfully defended themselves from behind a natural rock formation. The Indians apparently had no desire to capture them, but seemed to prefer a sharp-shooting campaign, calculated to tire out the Americans. At the end of the second day, the leader of the Indian band walked out into the open field, and made signs indicating that he desired a truce. Erickson met the Indian half way, and after a sharp parley in broken Spanish, the Indian was informed that the Americans were not natives, but strangers hunting for gold.

This information was not satisfactory to the Indian chief, who told the white men that they would be allowed to go unmolested if they would agree never to come back or to tell where they made their discovery. This seemed like a good settlement of a bad case, and the Americans readily assented. At a ranch which they passed on their way north, Erickson and Tharoldson were told that the Yaquis had wonderfully rich gold deposits which they carefully guarded, always driving out prospectors and discouraging immigration in general. Notwithstanding their experience with the Indians, they intend to return in the fall, when, they believe, the Indians will have been subdued and rendered harmless by the Mexican soldiers. They believe that the stream from which they washed their gold flows down from rich quartz deposits.

The Cost of Calumet Copper.

A noticeable feature of the annual report of the Calumet and Hecla is the absence of specific information which would enable one to determine the exact cost of production. This is a point upon which the Calumet and Hecla's officials are never very specific. The Boston News Bureau has endeavored to put two and two together and determine the cost from various items given in the report. It goes about its little task in arithmetic in this way:

Interest always attaches to the cost of making Calumet copper. The report does not give information by which the cost can be accurately determined. Gross or net receipts are not given, and no information is offered as to the amount of rock stamped or the mineral smelted. The cost per pound, however, can be approximated by averaging the price received during the year, deducting any increase in the surplus or adding any decrease, and dividing the remaining result by the pounds of refined copper produced.

As to the average price of copper received: The report states that the price of copper varied from 18½c. to 16c. during the fiscal year ended April 30. The open market price for this period by months was as follows

					Average
May	18¼	June	18⅝	July	18¼ 1st quarter 18¾
Aug.	18¾	Sept.	18½	Oct.	18⅛ 2d quarter 18⅜
Nov.	17⅝	Dec.	17⅜	Jan.	17¼ 3d quarter 17⅝
Feb.	16⅝	Mch.	16⅜	April	17 4th quarter 16⅝

Mean average, 17⅞

Assuming that the Calumet received an average of only 17¼ cents for its output last year, we have gross receipts of $17,012,600; dividends paid, $8,000,000; surplus decrease, $337,686. We therefore have $9,350,000 as in a general way representing the company's cost of copper, including charges for construction, and the many miscellaneous items which this company includes in its operating figures. On an output of 89,096,000 pounds of refined, we have a cost of 10½ cents per pound. We do not figure upon the actual amount of refined copper produced (as this includes 9,528,000 pounds taken from reserves) but upon the actual production of mineral expressed in pounds of refined.

This high price would indicate that there have been unusually heavy charges for construction included in expenses, and that the cost of making copper has materially advanced over the cost of two years ago, before labor was paid the present wages, and before the advance in iron and construction material.

What Tense Is Leadville?

The Leadville Herald Democrat registers a protest against the use of any form of the past tense of the verb "to be" as the predicate for the proper noun, Leadville. In other words, it declines to allow the classification of Leadville among the "has beens." It allows the present and future, but it is too well satisfied with the present to care whether the future is used or not. To say that "Leadville has been" is very ungrammatical, according to the Herald Democrat, whose editor was tempted to deliver his lecture on syntax by the innocent statement of some harmless sheet that "Leadville has been a wonderful camp." The editor proves his case by reciting the following facts which will satisfy most people that Leadville is entitled to the free and unlimited coinage of the verb "to be" in any tense desired: Possibly this camp can not compete with Cripple Creek in the number of stock companies, and it does not possess the luxury of a stock exchange. It issues no flaring circulars and there are some of the barren granite rocks and kopjes which are actually not leased and then stocked for several million dollars. But it does possess some features which ought to place it in the category of the great camps of the state.

It has fifty producing mines, which are shipping to the smelters 2,500 tons a day of ore, the gross value of which is $50,000. There are fifteen shafts being sunk in various portions of the district, which will cost not less than half a million dollars.

It is the only camp in the state where all the various characters of ore can be found in abundance, so that the necessary smelter mixtures can be easily obtained. These ores include the sulphides, oxides, argentiferous iron, manganese and silicious ores.

Three large smelters are in operation, with a capacity of over 1,500 tons daily, but the camp supplies large quantities of raw material to the majority of the furnaces of the west.

Graduation at Van Der Naillen's.

The school year for 1900 has closed in the mining department of the Van Der Naillen School of Engineering at San Francisco. Degrees were conferred upon thirty-nine students, twenty-two of whom took the course in mining engineering, and the others the assaying course. Several of the graduates have already secured excellent positions for the coming year. The following is a complete list of the graduates:

Mining Engineers: California—I. C. L. Thomas, Stent; G. C. Colbert, San Francisco; L. Everett, San Francisco; G. F. Rhodes, Berkeley; F. C. Davis, Forest; J. E. Gardner, Napa; E. Wheeler, Uklah; F. A. Gawthorne, Oroville; C. J. Pringle, Half Moon Bay; H. C. Glass, San Ramon; H. H. Cardnell, Roseville; H. B. Tiedeman, Alemeda; E. B. Olney, Chico; H. A. Kuns, Ingomar. Montana—J. W. Woodford, Martina. Arizona—J. D. Helm, Wickenburg; E. Schmidt, Congress; J. F. McDonald, Bisbee; F. Watt, Congress. Washington—E. E. Petty, Nelson. British Columbia—A. Muir, Vancouver; A. R. McDonald, Vancouver.

Assayers: California—H. S. Siskom, Shasta; E. E. McWayne, Drytown; P. L. Shelford, Healdsburg; F. Lucas, San Francisco; A. Wrightson, Santa Rosa; H. F. Lyons, San Francisco; A. E. Foster, San Francisco; H. Norman, Keswick; E. B. James, Groveland; W. D. Davidson, Bodie; N. Wrinkle, Keeler; R. Wrightson, Keswick. Arizona—J. C. Riggs, Wilcox. British Columbia—C. Farrell, Moyle. Kansas—D. Haberbosch, Selma. Yukon Territory—F. C. Chilkes, Dawson. Oregon—H. T. Coffin, Portland.

Canadian Bounties on Ore.

The Port Arthur Chronicle recently published a long article attacking the bounty of $2 a ton which the Canadian Government pays on pig iron produced from imported ore. It is claimed that this bounty has stimulated the sale of American ore and has operated to retard the workings of new Ontario districts. It says further that exportation to the United States, on which the Helen, the Atikokan and the Mattawin mines will depend in some measure, is restricted by the American duty, which has also prevented the sale of some properties.

The general subject of the ore bounty is brought up by the approach of the productive stage in the new iron fields of the Rainy district, which is being hastened by the extensions of the Ontario and Rainy River Railroad. As the time for producing comes near, those who are interested in the iron fields are beginning to wonder what they are to do with their ore. The Chronicle says:

"The greatest problem that we have to solve in connection with this subject is the utilization of our own ores for the production of our manufactured articles—that is, that all iron entering, wholly or in part, into the manufacture of articles which we use in any shape or form, shall be produced from our own raw material, and not from material imported from other countries. Our first step in advancement is to utilize our own ores for the manufacture of those articles that we need, from a needle to a steel rail; then, having control of our domestic market, we will be in a position to launch out and compete in the markets of the world."

The Montana School of Mines.

The Montana School of Mines at Butte will begin its college year on the second Tuesday of September. A serious lack of funds has delayed the successful opening of the school for some time, but it is now hoped that the institution can open and offer the courses of study which its organizers have carefully arranged. The location of the school in one of Montana's richest mining sections where many big smelters and metallurgical works are in practical operation gives it many advantages over many other institutions of its kind. The present faculty is composed of Nathan R. Leonard, acting president, and professor of mathematics, recently of the State University of Iowa; William King, professor of chemistry and metallurgy, a graduate of the Western University of Cleveland, and for sixteen years instructor in chemistry in the Case School of Applied Sciences in Cleveland, and two years in the College of Montana at Deer Lodge; Dr. Chas. H. Bowman, professor of mechanics and mining engineering, who has attained considerable distinction as a lecturer and instructor on

mechanics and engineering subjects; Dr. Alexander Winchell, professor of mechanics and mining engineering, a graduate of the University of Minnesota, and at present United States mineralogical expert in charge of the mineral exhibit of the Government at the Paris Exposition.

SANTA FE ROUTE TO USE OIL AS FUEL: It is reported from Chicago, that the operating officials of the Atchison, Topeka & Santa Fe Road have decided that all locomotives on its line in California shall be equipped by October for the use of oil as fuel. The road will consume about 720,000 barrels of oil annually. For about six years the Santa Fe has used more or less oil as fuel in California, all engines operated between Barstow and San Diego having been oil consumers since January 1 last. The company finds oil cheaper than coal, especially as it owns its own oil-fields.

Latest Mining Decisions.

Specially prepared for THE MINING AND METALLURGICAL JOURNAL

The place of an explosion in a mine, and its cause, and what, if any, negligence the owner is guilty of, are questions for the jury, when the evidence offered requires their submission to the jury. Deserant vs. Cerillos Coal Railroad Company, 20 Sup. Ct. Rep. (U. S.) 967.

The duty of a mine owner as to ventilation of his mine and keeping it clear of standing gas is made imperative by the act of Congress of March 3, 1891, and the consequence of neglecting it cannot be excused because some workmen may disregard instructions. Deserant vs. Cerillos Coal Railroad Company, 20 Sup. Ct. Rep. (U. S.) 967.

Under Rev. St. U. S. § 2320, requiring the discovery of a vein or lode within a quartz claim before any right can be acquired thereto, it is enough to entitle the discoverer to protect his mining rights if ore or metalliferous rock be found in place sufficient to warrant a prudent man in spending time and money on it, though it may not contain ore in paying quantities. Muldrick et al. vs. Brown et al., 61 Pac. Rep. (Ore.) 428.

Instructions as to the duty of a mine owner with respect to ventilation of the mine and keeping it clear from standing gas are erroneous, when they are so inconsistent with other instructions that they tend to confusion and misapprehension, and when they make his duty relative instead of absolute, as required by the act of Congress of March 3, 1891, making the test what a reasonable person would do, instead of the command of the statute. Deserant vs. Cerillos Coal Company, 20 Sup. Ct. Rep. (U. S.) 967.

Where defendant testified that plaintiff, the owner of a quartz mine, gave him permission to locate a placer mine on the same ground, and that he spent $1,100 on a debt and water right necessary to work it, but on cross-examination stated that he was not told by plaintiff to work any particular mine, and plaintiff denied having any such conversation with him, but stated he notified him to keep off the ground, plaintiff was not estopped from asserting his claim to such quartz mine. Muldrick et al. vs. Brown et al., 61 Pac. Rep. (Ore.) 428.

TRADE NEWS.

Something unusual in the line of trade literature is an illustrated book recently issued by Arthur Koppel of 68 Broad street, New York City. The book is printed in six languages, and contains descriptions, with a liberal use of illustrations, of portable and permanent railways and railway appliances. In addition to over 100 cuts the book contains much interesting reading matter of a general nature. Several pages of the book describe the use of ore cars in a number of the largest mines in the world. The book is distributed free of charge to persons interested.

Mining engineers and contractors are not strangers to the merits of Albany Grease. This compound has been before the public for twenty years or more and has sustained its reputation as the best of lubricants under the most trying circumstances. The following testimonial was recently sent to Adam Cook's Sons, 313 West Street, New York, the sole manufacturers of this compound, by C. A. Lucas of Bristol, Vt.: "I have used your Albany Grease in the Train-Smith Co.'s Pulp & Paper Mills for the past nine years, and consider the same the best grease on the market, and I think it has saved me thirty per cent in our oil bill. I have tried several other greases that cost less, but am satisfied that the Albany Grease is the cheapest in the end. C. A. Lucas, Supt., Bristol, N. H."

An interesting exhibit at the Milwaukee Mining Congress was that made by Fairbanks, Morse & Co. of Chicago, who had on exhibition a geared gasoline hoisting engine which possesses some very novel features. The machine is simple and compact and has the appearance of an efficient and economical machine.

The large feature of the exhibit was a 54-HP. combined gasoline engine and air compressor. The air compressor is attached to the engine frame by bolted lugs, thus forming a compact, self-contained combination. The air cylinder is double-acting and thoroughly water jacketed. The valves are a special feature. They are automatic and of an improved type. The machine is automatic in its action, and is provided with an unloading valve which maintains a uniform pressure in the receiver. As soon as the desired pressure has been obtained, the unloading valve cuts out the action of the compressor cylinder and the engine governor controls the supply of fuel admitted to the engine, thus making it an exceptionally economical outfit under varying loads.

These compressors are being generally used for mining work, and in countries where the mines are in remote localities and where water and fuel are inaccessible, the cost of operating on gasoline or distillate is much cheaper than coal would be. A few gallons of the liquid fuel can be easily transported on mule back and will do the work of several tons of coal. The supplying of water is practically dispensed with, as cooling tanks are provided and the same water is used repeatedly, thus effecting a great saving at this point. This compressor was shown supplying air for the Leyner rock drills exhibited by the Edward P. Allis Co. of Milwaukee, and great interest is being taken in the compressor.

Construction and Development News.

Edw. Helen of Railroad, York county, Pa., is in the market for steel rails, trucks, shafting and pulleys.

The Standard Gold Mining Co. of Dahlonega, Ga., will soon put in a 120-stamp mill. H. D. Ingersoll is manager.

P. E. Finzel and Elias Merrill of Oakland, Md., have organized a company to develop gold and silver properties near Lonaconing, Md.

Zinc properties near Knoxville, Tenn., are to be developed by J. E. Lutz, J. C. White and others. A $250,000 smelter will be erected.

J. A. Robertson of Monterey, Mex., is reported to have organized a European company, with a capital of $1,000,000, for the erection of a smelting plant at Monterey.

It is reported that M. Guggenheim's Sons, whose head office is at 30 Broad Street, New York City, contemplate making extensive additions to their concentrating and smelting plants at Monterey, Mex.

The American Steel & Wire Co. is planning to double the capacity of its Newburg plant. The complete works will constitute the largest steel and wire mill in the world, and will give employment to about 10,000 men.

AMONG THE ENGINEERS.

M .B. Philips of Los Angeles, Cal., has been to Denver on mining business.

H. B. McKim of Denver, Colo., has undertaken a commission in the Cochise mining district in Arizona.

Courtenay de Kalb of New York has been in Helena, Mont., looking up a number of properties in the Rimini district and preparing a report upon them.

Professor E. C. Linderman of Denver, Colo., has completed an examination of the Toledo Avenue Co.'s holdings in Leadville. He pronounces the property one of the best in the district.

PERSONAL.

President Chas. S. Guthrie of the American Steel Hoop Co. has returned from an extended trip through Europe.

Edward Van Vernon of Los Angeles, Cal., has gone to Ballarat, Inyo county, Cal., to take charge of a quartz mill for a mining company.

A. E. J. Percival of Spokane, Wash., has been in New York, Boston, Chicago and Milwaukee organizing a syndicate to operate Washington mining properties.

C. G. Carruthers of Colville, Wash., has been engaged to survey and direct the course of development on the Black Jack mine on Gold Hill, north of Myers Falls.

Fred Schmidt, formerly secretary and treasurer of the Youngstown Bridge Co., has become assistant treasurer of the American Bridge Co., with headquarters at Pittsburg.

Benton Orbison, for five years superintendent of a Chicago machinery house, has become general superintendent of the American Steel Castings Co. at its Alliance, O., plant

E. R. Barkley, a Salt Lake City mining operator, has gone to Chihuahua, Mex., to perfect his title to several recently acquired mining claims in the Chuchupa district in the Sierra Madres.

Benedict Crowell, senior members of the firm of Crowell & Peck, chemists and metallurgists of Cleveland, O., has undertaken a commission to examine mining property near Richmond, Va.

Herbert A. Blackston of Boston has been in Helena, Mont., to witness the operations of the Cambria Mining Co., of which he is a stockholder. This company has bought the Cross-Cut and Mitchell mines in the Winston district.

Captain E. E. Rogers of Cleveland, O., one of the principal owners of the Mascot mine near Pearce City, Ida., has recently been at the mine examining the property and watching the installation of a new 5-stamp mill and a 40-HP. boiler.

Lucius P. Deming of New Haven, Ct., manager and general superintendent of the Alexandro Copper Mining Co. of West Virginia, has been in Silver City, N. Mex., recently, inspecting the Dodd and Worthen properties which have been bought by his company.

C. E. Breeding of Seattle, Wash., and A. F. Judson and F. L. Morrill of Los Angeles, have been at Fort Wrigel, Alaska, inspecting mining properties. They represent a number of capitalists who contemplate organizing a company for the development of southeastern Alaska quartz properties.

President Charles M. Schwab of the Carnegie Steel Co. has announced that he intends to put up a building in Pittsburg for the St. Joseph Protectorate and Industrial School. In addition to erecting the building, Mr. Schwab will regularly pay the salaries of all teachers at the institution.

W. S. Keyes, president of the California State Mining Bureau, recently went to Rossland, B. C., in the interest of the Iron Mask Co. Mr. Keyes is to give expert testimony in the law suit between the Iron Mask Co. and the Central Star Co. which will be tried in September. David J. Buckley of Denver, Colo., will also act for the Iron Mask Co. in the suit.

C. Rhodes, manager of the New Zealand Mining Co. of New Zealand, has been in Utah and other Western States studying methods of treating the ores of his mines. He has visited several branches of the American Smelting & Refining Co., including the big establishment of the Consolidated Kansas City Smelting & Refining Co. at Argentine, Kan.

Edwin G. Adams, formerly connected with the bridge and construction department of the Pennsylvania Steel Works at Harrisburg, Pa., has succeeded in sending information to his friends from Shanghai, China, that he is safe and in good health. It was reported at one time that he had been killed by the Boxers. He is an instructor at the Chinese University at Tien-Tsin.

CORRESPONDENCE

CALIFORNIA.

(From Our Special Correspondent.)

Randsburg, Cal., July 19, 1900.

Work has commenced on the reservoir at Goler on the Yellow Aster well. J. Z. Brown received the contract. The pumping machinery has commenced to arrive, and the pipe is all layed to the mill at Randsburg, which it is understood, will be increased to 100 stamps. It is now thirty stamps.

The new Randsburg Exploration Company, which is composed entirely of Yellow Aster employes in various responsible positions, are prospecting a mine at Garlock, and expect to mill not less than 100 tons of ore at the mill there during August. In milling this ore they will try the new coal, which is only a few miles distant. If the coal proves all right it will be used at the big Goler pump as a regular diet.

A number of incorporations of mining and milling companies are being made and talked of, and the indications are that there will be a vast increase in mining activity the coming season.

The increased capacity in the Yellow Aster and twenty-five smaller producers, with cheap local coal and plenty of clean water is bound to give an impetus to development and prospecting, which will be earnest and successful.

A large amount of speculation is being indulged in as to the location of a number of proposed through railroads. When and where one will be built remains as much of a mystery as it was ten years ago.

Considerable ore is being shipped and milled at Barstow, the entire cost of shipping and milling combined being but $2.75 a ton.

Spangler Brothers are making a sale of their enormous properties between here and Borax Lake through Doye Bros. of Los Angeles. H.

(From Our Special Correspondent.)

Needles, Cal., July 18, 1900.

Needles is fast becoming a prominent mining center. The river is now navigable for ninety miles above Needles to the Gulf of Lower California, and when the Government appropriations that have been secured are utilized, navigation will be extended northward much farther. The whole length of the river passes through one of the richest mineral belts in the Union. The Santa Fe road traverses the entire length of this vast mineral belt, affording excellent transportation facilities. The division superintendent of the road, John Donair, states that the company will do all that is possible to promote mining and encourage the miners in the development of the section.

L. V. Root and Monaghan & Murphy, all enterprising citizens of Needles, are giving considerable of their time to mining enterprises in the vicinity.

The river steamer Cochan, of 125 tons capacity, has been busily engaged transporting mining machinery and supplies to up-river points since 1899, and its prospects are very flattering for a greatly increased business.

MICHIGAN.

(From Our Special Correspondent.)

Houghton, Mich., July 21, 1900.

Developments at the Champion mine have been most satisfactory and the wisdom of the managers in pushing work to the fullest extent is already demonstrated. All four shafts will be equipped. Before many months, the directors are confident, the mine will be in a position to supply rock for one or two heads of stamps which will be available for the company's use until its own mill can be constructed. The Champion may build its mill at the mouth of Grave Rat river, seven miles west of the Atlantic and Baltic mills. A branch of the Copper Range road will be run out to the Champion.

The Copper Range road has made arrangements by which it will operate the Atlantic and Lake Superior Railroad, running from the Baltic and Atlantic mines to the stamp mills on Lake Superior. The Copper Range, it is reported on good authority, is now earning a handsome margin over and above its operating expenses. Nevertheless, an assessment of $3 a share has been levied by the directors, payable August 6. A force of 500 men will soon be working under Contractor Johnson on spurs from the main line to the various mines. The daily business of the Copper Range is said to be the heaviest in the history of the road.

It is announced that the $3 assessment on Copper Range stock is to provide half the funds for the future development of the Champion mine, and funds for the building of the connection to the Champion mine, and for meeting the increased expenditures incurred by present development. Recent washouts necessitated the rebuilding of several sections of the roadbed.

The Calumet and Hecla is about to build 100 new houses for its employes. Although 600 or 700 buildings have been completed yearly for the past five years, houses are now scarcer than ever.

It now seems that it will require the balance of the year to rebuild thoroughly Calumet and Hecla's No. 2 shaft, which is burned out from the sixth down to the twentieth level, a distance of a quarter mile. A new shaft-house of steel is to be completed in place of the old wooden one.

The Calumet and Hecla has purchased from Pennoyer Bros. of Sheldrake, Chippewa county, Mich., all the pine lands owned by the Sheldrake Lumber Co. in Chippewa and Luce counties.

Negotiations are under way, it is reported, for the opening of the Pennsylvania mine.

Construction work has begun at Hancock on the Houghton County Street Railway which will extend from Houghton to Hancock, thence to Red Jacket, traversing the lands of the Quincy, Franklin, Osceola, Tecumseh, Rhode Island and Calumet and Hecla companies. Rights of way have been obtained for the entire line, except for a mile or so from the boundary of the Osceola to Larrium and Red Jacket, over the Calumet and Osceola properties.

MINNESOTA.

(From Our Special Correspondent.)

Duluth, Minn., July 23, 1900.

The Minnesota Iron Co. has sunk through the taconite foot wall at its explorations in 59-14 district and is finding more and better ore. This is considered an unusually important discovery. It was never imagined until a year ago that ore existed under the taconite, and if it is found that the taconite is covering ore in other sections of the Mesaba range, new figures will have to be made as to the probable mineral wealth of the region. In a dozen properties where the taconite has been cut, the ore found below has been of better grade than that above.

Shipments have begun from the new mineral district of Michipicoten, north of Lake Superior. Many thousands of tons will be produced this year. The first ore went to the furnaces at Midland, Ont., and other shipments will be to Hamilton, Ont., and to American ports. The ore is a red and brown hematite of high grade and bessemer.

The Carnegies have sold to the Rockefellers a half interest of the Rouchcleau mine near Virginia, the price being $500,000. This gives the Rockefellers the entire control of the mine at a cost of about $950,000. The Rouchcleau is an undeveloped body of high grade ore. Four years ago the Rockefellers offered $1,250,000 for it, and put up a forfeit of ten per cent, which was retained by the sellers when the final deal was not closed. This ten per cent, amounting to $125,000, is figured in the present price paid.

Shut-downs and reduced forces are reported from several mines hereabouts. The Lamont, at Crystal Falls, has closed down because the shaft is squeezing together and may collapse, and it is considered unsafe for the men to remain under ground. The workings have been carried too close to the shaft, and it is feared that the mine may have to be reopened from the surface.

The Bristol mine, in the Menominee range, has reduced its force from 100 to thirty men, and will remain comparatively inactive until next year.

Ten men were killed a few days ago in the Clark mine by an explosion of dynamite in a drift. The mine is the property of the American Steel & Wire Co., and had begun to ship only three weeks before the accident.

MISSOURI.

(From Our Special Correspondent.)

Joplin, Mo., July 21, 1900.

Continued improvement is announced in the zinc ore market, and prices have again advanced. All grades of ore advanced $1 a ton during the week except fancy grades, which brought, as in the preceding week, $28 a ton in the bin. This price was again paid for all the ore produced at the Independence mine near Joplin. The Eagle mine at Belleville received $27.50. In other parts of the district high grade zinc brought from $25 to $27 a ton in the bin. The demand was reported greater from all sources than for several weeks.

Lead sold all the week at $21.75 per thousand pounds delivered, the same as the previous week. In the corresponding week of last year, zinc ore brought $44.50 a ton, and lead ore brought $27.50. Sales were greater this year by 979,940 pounds of zinc and 77,730 pounds of lead, and the value was greater by about $100,000.

The Colonial Zinc Co. has bought the McAbee lease on the Harper land in Cottonwood Hollow west of Joplin. J. H. Dangerfield and F. J. Hart negotiated the sale, the price being $20,000. The Colonial Co. is moving a mill to the grounds in order to work the ore from the House of Lords mine. This mine, working with three men in the ground and two hand jigs, has produced a car of jack a week.

On G. W. Armstrong's six lots of the Black Cat lease on the Glover farm, a big strike of steel jack and lead has been made. The strike was made at thirty-two feet in open ground, and the drill shows ore from thirty-eight feet to eighty-six feet. The ore runs about three-quarters steel and one-quarter lead.

J. L. Hurley, of Webb City, is putting up a 24x60-foot building for the Homestead Mining Co. at the Blue Wing mine. A roasting plant will be placed in the building.

A $12,000 plant will be built by the Chicago capitalists who have bought an interest in the Big Four on the South side at Galena.

Two and one-half miles north of Joplin John Sandy has struck a fine prospect of lead at a depth of fifty feet on virgin ground, thus opening up an addition to the Tuckahoe stretch of mining territory.

Work is still progressing in the ground at the Jack Rabbit plant in Aurora. The mill will not be opened up until there is an improvement in market prices of jack.

At the Clara Barton in Spurgeon, the new shaft is down nearly forty feet in hard rock. Several hundred pounds of lead were taken out of this shaft at six feet.

A good strike of jack is reported on Postmaster Coleman's lease at Aurora. The drill entered good jack at 195 feet. The strike is only a short distance from the west line of the Ozark range.

MONTANA.

(From Our Special Correspondent.)

Butte, Mont., July 24, 1900.

The threatened labor troubles which were predicted as a result of the refusal of the Amalgamated interests to grant an eight-hour day have not developed. At a meeting of the Miners' Union, on July 20, the men received the letters of the Anaconda and Amalgamated and laid them on the table without comment. A majority of the union miners are against any movement to force the eight-hour issue, and many of them were opposed to the effort being made in the first place. All the trouble in sight, either present or prospective, is caused by the persistence of politicians and labor agitators, whose motives, however, are understood and discounted at their true value. They are not likely to induce the Union to take further action, unless this should be done at some meeting when the conservative element is by some chance in the minority. What the miners have in view is a petition to the Legislature urging legislation which will make an eight-hour law imperative.

John Byrne, State inspector of mines, has sent out a letter revising the figures given by him in a recent document concerning the number of men employed in the recent mining companies hereabouts. "Since the list recently printed showing men employed in different mines was made up," he says, "the smelting plant of the Montana Ore Purchasing Co. has nearly doubled its capacity, calling for a proportionate increase in the force employed at the mines. The number of men employed by W. A. Clark in the mines owned and controlled by him, has also been largely increased owing to the same cause. The voluntary granting of an eight-hour day to the miners employed in the mines of the Montana Ore Purchasing Co., the Heinze interests and W. A. Clark has also tended to increase their working forces."

Receiver Wilson of the Minnie Healey mine has received permission from Judge Clancy of the District Court to survey and examine the Boston and Montana workings in the Gambetta and Piccolo mines for the purpose of verifying his suspicions that the company is working a vein belonging to the Minnie Healey. For the same purpose, Mr. Wilson will be permitted to do more or less development on the Boston and Montana.

WASHINGTON.

(From Our Special Correspondent.)

Seattle, Wash., July 20, 1900.

The report of the United States Assay Office, at Seattle, for the fiscal year ending June 30, shows that in that time 5,808 deposits were made aggregation $13,630,326.58. This is more than double the amount received for the year ending June 30, 1899, when deposits numbered 3,429 and represented a value of $6,504,962.64.

The deposits by months in the past year were as follows: July, $4,257,376.45; August, $963,505.46; September, $3,263,224.42; October, $2,424,924,60; November, $944,962.64; December, $125,646.25; January, $139,962.63; February, $133,033.36; March, $101,402.35; April, $71,099.32; May, $67,433.70; June, $1,137,756.41.

This shows that the month with the largest deposits was last August and the smallest last May. Since the first of July the office has taken in over three and one-half millions of dollars, as against four and a quarter for July, 1899. It was expected that the receipts for July would reach $6,000,000.

ONTARIO.

(From Our Special Correspondent.)

Sault Ste. Marie, Ontario, July 20, 1900.

The amazing total of 8,500,000 gross tons is the record of iron-ore shipments for the year to date. Should the present rate of shipments be continued throughout the remaining four and a half months of navigation, the highest estimate made at the beginning of the season will be attained. By July 1 the Lake Superior ports had shipped 5,068,000 tons, which is only 600,000 tons less than their record to August 1 a year ago. The Duluth, Missabe and Northern established a record in June as the best month's business made by any road at any time in the Lake Superior country, recording shipments of 709,000 tons.

On July 15 the first cargo of ore was shipped from the new district of Michipicoton, on the Canadian shore of Lake Superior. By the end of the year the contractors hope to be shipping 2,000 tons daily.

The Mahoning mine now has an ore area of thirty-five acres uncovered, to which about twenty acres are likely to be added. The mine is working on a large stripping job, and is likely to accomplish about 180,000 yards this year. In the thirty-five acres referred to, there are places where the ore body is about 200 feet in depth. This year's production is mainly from the second level, which averages about forty-five feet below the top of the ore.

The Macgregor, on the Mesaba range, owned under lease by S. Dessau and others, has been closed down temporarily for the installation of machinery. Four miles west of the Macgregor is the Stevenson, which is shipping from two shafts, while the third shaft is almost ready for work.

A discovery of ore is reported in the Cascade range at the old Platt mine. It seems likely that the Richmond mine may soon be the only open property here, as the Star West is likely to close soon, while the Stegmiller is already closed.

(From Our Special Correspondent.)

Port Arthur, Ont., July 21, 1900.

In the Seine River region there is less activity among the gold mines than for some years. Only four or five properties are now active. There is more work in the upper Seine, and some of the largest foreign syndicates there are reporting excellent results in gold.

A disagreement between stockholders as to the policy to be pursued on the Triggs mine has resulted in a shut-down. Some of the stockholders favor the erection of a ten-stamp mill, while others insisted that a forty-stamp mill should be erected.

A carload of concentrates from the new Hunter property has been shipped to refining works in the United States. The report from the shipment is awaited with the greatest interest, although it is known that the product is rich enough to warrant extensive operations. Preparations are being made to open the mine on a large scale.

A recent run of rock from the Champion mine resulted in an average of $14 to the ton from forty-five tons of rock. The result was so encouraging that ten stamps will be run on the ore as long as the mine can furnish it. The company will erect a mill of its own.

The gold product of the Mikado at Rat Portage was $14,000 for the month of June. Improvements, which will cost at least $50,000, have been undertaken on the mine and mill of the Mikado.

GENERAL NEWS

ALABAMA.

H. C. and W. B. Reynolds of Blocton will soon begin the development of 10,000 acres of coal land on the Cahaba River.

H. S. Jenkins and others of Montgomery have acquired the McDonald mine near Carbon Hill. They have organized a company known as the Elk River Coal Co., and will develop the properties on a large scale.

Coal mines in Winston county will be opened in the near future by the Delmar Mining Co. of Delmar.

The Sloss mine No. 1, at Birmingham, was damaged to the extent of $10,000 by fire recently. The miners worked diligently to subdue the flames, and succeeded in saving the compressor, hoisting engine and one-half the trestle. The loss was covered by insurance.

ALASKA.

Valuable mining properties near Yakutat have been located by a California company. The property comprises about forty platinum claims. Assays taken from samples secured by preliminary work last year were most satisfactory. The work was stopped by an earthquake at that time, but there are now twenty-five men at the mines and the force will be doubled soon.

Stewart City, which in July, 1898, had a population of 8,000 people, has now not more than 300 inhabitants. The place is a good illustration of the way mining camps sometimes disappear. The gold finds which were reported there did not develop as well as was expected, and Alaskan miners have no time to waste over poor districts.

Estimates from Skagway indicate that at the end of June, three-quarters of the Klondike clean-up for the season had been completed. Because of the advance of the season the big financial companies are hurrying their gold out of the country. While a great deal is coming up the river and out to the coast by the Skagway gateway, a large amount is also going down the Yukon. The steamer Hannah left Dawson for St. Michael, June 22, carrying $750,000 in gold for one of the banks, and the same day the steamer Ora started up the river with $600,000. It is expected that the gold coming up the river will go to Seattle three weeks earlier than that going down, because of the more circuitous route and the likelihood of a wait for a connecting ocean steamer.

ARIZONA.

Charles E. Udall is managing the Majorres Copper Co.'s ground in the Old Hat district, in the Catalina mountains. The group is owned by New York capitalists and consists of twenty claims. Twenty-one men are steadily working on development, and at some time in the near future a complete plant is likely to be installed.

The rebuilding of the Commonwealth mill at Pearce will be pushed as rapidly as possible, but it is not thought that it will be ready for business within six months. A fifty-stamp mill will be put up. The company's loss by the fire is estimated at $300,000.

Date Graham has made a rich strike in the Huachuca mountains, where he has been working Graham's Copper Queen for three years. He has found deposits that yield, it is said, $18 silver, $5 gold and 5 per cent. copper.

W. S. Norman, secretary of the Big Iron Consolidated Mining Co., says in his monthly report for June concerning the company's property in the Pierre Lake district, in the northwestern part of Stevens county, that fourteen assays taken in the cross-cut show average values of $4.98 in copper, $1.22 in silver, and $12.22 in gold, making a total of $18.42.

New claims in the Eureka district in Yavapai county are receiving the attention of the Wertheimer Mining Co. of San Francisco. Rich copper ledges are reported there.

The Cambridge Gold Mining Co. has been organized with its principal place of business at Phoenix, to carry on a general mining business in Arizona. The amount of capital stock is $250,000, issued in 50,000 shares of $5 each.

Work will soon be commenced on the rebuilding of the Detroit Copper Co.'s reduction plant at Morenci, which was recently destroyed by fire. It is thought that the smelting furnaces can be temporarily repaired so that smelting may be resumed shortly. The new concentrator of 600 tons capacity on the Yankee shaft was left uninjured, but the old concentrator was entirely destroyed.

These are busy times at the Peabody mine, nine miles from the Cochise station. The daily shipment record is two carloads of high-grade ore. Two hoists are being operated and forty men are regularly employed.

It is reported that John Develin, of Montana, has decided to spend about $40,000 in running a tunnel under the mountain nine miles west of Jerome, hoping thus to strike a big iron dyke which runs through the mountains. Mr. Develin thinks there is a likelihood that he will strike a big body of copper.

CALIFORNIA.

U. Vader of Victor has just completed a five-stamp mill with eight cyanide tanks and several concentrators. The plant will soon be in operation.

The Primrose mine at Randsburg, under Superintendent Godsmark, is forging ahead as usual. They have on the dumps ore enough for two years to come.

The Standford and Buckboard mines, two miles from Randsburg, in what is called the Stringer district, are developing into first-class properties, and the owners feel confident of flattering success.

The Baltic mine and mill southeast of Randsburg have been worked for past three years, and 2,000 feet of development work has been done. The ore averages from $10 to $20 to the ton. They now have fifty tons ready for shipment. Messrs. Bentley and Winn, the owners, are industrious workers.

The recently discovered Black Nugget dry placer claims eighteen miles north of Barstow, known as the Duncan and Clark claims, now employ eleven men at dry washing. There is a good wagon road to the claims, but as in many other camps hereabouts water is scarce. Newcomers are arriving every day. The gold taken out is clean and handsome. The camp will grow. Barstow itself is more of a railroad town than a mining camp.

The Needles Smelting Co.'s new smelter now under construction will be completed this month. The entire cost will be between $25,000 and $30,000. It is located half a mile north of the town of Needles, on the banks of the Colorado River. It is an adobe building, the finest and most substantial in this section. It is one of the most conveniently arranged buildings for smelting in the country, as are all buildings of the company. The question of material to work on is not considered, as they will have more than they can do from the beginning. Mr. Underwood is the constructing engineer, C. S. Corning is the general manager and Mr. Barclay will be the metallurgist. The townspeople generally are very much elated over the enterprise.

The Empire Mining Co.'s mine located forty miles below the Needles has closed down the property for sixty days. E. S. Blasdel, the superintendent, states that a 300-ton smelter will be located on the property this fall. Mr. Tissions of New York, who belongs to the Copper Syndicate, and who is also interested in the Copper Queen of Ivanpah, is backing this enterprise. The properties of the company are looking the very best, and a contract for 200 feet of development work has been let.

The Ludlaw district, between Daggett and the Needles, in which W. R. Woodward and John Suter are interested, are showing up excellently. The work on the Bagdad mine is progressing very favorably. The 35-HP. gasoline hoist will soon be erected. The work on the Gentry mine has been stopped for the present, owing to the striking of a fault in the vein.

Don Palmer, who holds a bond on the old Shear mine at Central Hill, Calaveras county, has commenced work upon the property.

At the Oriole mine near Angels camp, Calaveras county, crosscutting is still being done at the 400-foot level. Seventeen men are now employed underground. A fine body of ore has been struck in the south drift of the 1,600-foot level of the north shaft. The ore body is nearly twenty feet thick and all good milling rock.

A wonderful strike was made in the Confidence mine, Tuolumne county, in the south drift at the 350-foot level. Eighteen feet of ore showing free gold everywhere were encountered. Twenty stamps are kept busy on the ore night and day.

J. H. L. Tuck of San Francisco is opening a mine seven or eight miles west of Placerville, El Dorado county. At present the company is grading for a mill and getting some of the necessary buildings under way. It is a low-grade proposition.

At the Cross shaft, near Angels, Calaveras county, the work of putting in the new hoist is going on rapidly. It will be the third largest hoist in the United States.

The Free Lance on Berger's ranch, near the Tuolumne River in Tuolumne county, is dropping five stamps on good ore. Twelve men are employed. The vein averages from three to four feet.

COLORADO.

The Forest City Co. at Empire has apparently determined to reach depth on the Empire City mines before starting in extensive drifting work. This is indicated by the fact that the shaft is already 200 feet below the tunnel level. The ore chute, which came in about 300 feet from the tunnel mouth, was stoped to the surface, and

yielded ore that ran as high as ten ounces to the ton gold.

The officers of the Union Gold Mining Co. of Colorado Springs express considerable satisfaction over the figures in their official reports, which have just been received. Developments for the past year show 2,918 feet of drifting, 1,349 feet of cross-cutting, and sinking on prospect shafts on the Pike's Peak vein, 1,207 feet. Total receipts for the year were $57,826.63, and the total net profit was $20,971.74.

W. R. Foley has purchased the Keystone at Cripple Creek from Miles McDonald for $60,000. He has also secured control of the Wideawake and the Molly Dwyre properties adjacent to the Pointer, which is already controlled by the Foley syndicate.

The New England Gold Mining Co., operating on the top of Straub mountain, in the Cripple Creek district, has begun a new shaft house to replace the one recently destroyed by fire. The shaft is now down to a depth of 270 feet, and the cross-cut being driven from the 235-foot level is showing most excellent results.

The Newhouse tunnel has recently been passing through a good part of the Seaton mountain mineral belt. The leasing company organized by the tunnel company is working the Amy C.-Gem Expansion vein, and the milling ore is being treated at one of the local concentrators, while the smelting ore is handled through the local ore buyers for shipment to the Denver smelters. Drifts are started on both sides of the tunnel.

The thirty-two foot shaft on the Morning Sun, in the Twin Lake region, Lake county, has just made a return from the smelter of $127.50 net per ton, from twenty-two inches of solid galena ore. The find was made in the thirty-two foot shaft.

The new Rocky mountain smelter at Florence will be ready for business in November, it is said, with a capacity of 500 tons a day. Another new enterprise in the district is a chlorination mill with five barrels and a 300-foot roaster building. A new cyanide building is also going up.

It is reported that W. S. Stratton has decided to put some of his money into the development of the John A. Logan mine at Cripple Creek. It is said that he will erect one of the largest plants in the State on the Logan. It is also reported that the 900-foot shaft of the Orpha-May will be sunk to 1,200 feet, and a cross-cut run to the Logan's workings for an air shaft.

J. R. McKinnie, R. P. Davie and L. L. Aitkin, of Colorado City, have acquired a mining property in Clear Creek county, Colo., valued at $250,000. The transfer includes the old Freeland mine, the Toledo mine, and the group of mining claims extending along the cross of a projected tunnel for a distance of one mile. The Freeland has made a production record rated at $4,000,000. The Toledo is producing about $3,000 a year, and has been opened to a depth of only 300 feet, and this, it is seen, is practically a new proposition.

IDAHO.

Important development work is reported on the Viola mine, Black Hornet district. The ledge has been cut in a long tunnel and drifted both ways, the operation with the up-raisers surrounding one of the biggest bodies of ore in this vicinity for a long time.

Articles of incorporation have been filed by the Novelty Mining & Milling Co., whose principal place of business will be at Wallace. The company will conduct an active mining business, and according to its incorporation papers, it is also organized for the purpose of "working slimes, extracting and saving lead, silver and other valuable deposits contained in slimes and waters in the creeks and streams of Shoshone county."

Another new company at Wallace is the Capitol Mining & Milling Co., which has a capital stock of $100,000, and has as its directors F. T. Brown, L. Ryson, P. F. McGovern, Joseph F. Whelan, P. J. Keegan and Thomas Noonan.

The War Eagle Co. is planning to put up the 20-stamp mill now at the Iowa mine at Quartzburg. The company finds that considerable value has been wasted by the past treatment of the ore. The metal that is ground very fine, it is found, goes off with the water and is lost. The War Eagle Co. will put in a new chlorination process in which electricity is used, and this, it is hoped, will save practically all the values.

Barry N. Hilliard and Clarence A. Hight have deeded to the Coeur d'Alene Mining Co. the placer claims, water, steel pipe line and other property on Pritchard Creek and its tributaries in the northern part of Shoshone county. The claims embraced in the sale cover a strip of twenty-five miles of placer ground, running through Pritchard and Eagle creeks, about twelve side gulches and the old channel on the north side of Pritchard creek.

MICHIGAN.

A net profit to shareholders of $10 a share is shown by the books of the Tamarack Mining Co. for the first six months of this year, after deductions are made for all expenses of construction on the fifth shaft and all other bills are paid. If the company can secure the same average price for its product in the second half of the year that it has in the first six months, the net profit should be $12 a share for the second half, or a total of $22. The engineers expect to reach the Calumet lode by the end of the year. In the fifth shaft, 300 feet is yet to be sunk, and the management does not count on hoisting rock from this shaft until next July, although a large increase in production is expected in 1901.

The lease of the Volunteer mine at Palmer by the Cleveland Cliffs Iron Co. was not renewed at its expiration on June 30, because the principal fee owner, General Russell A. Alger, declined to extend the lease, having decided not to have the mine operated longer on royalty. It is expected that the fee owners will work the mine themselves as soon as conditions are favorable.

Otto C. Davidson, of Commonwealth, Wis., has closed negotiations for a lease of the Beaufort mine for his company, Oglebay, Norton & Co., of Cleveland, O. Captain G. L. Woodworth has been placed in charge of the property. The mine is almost ready for production, but work will not be rushed until the market is more active.

Mitchell & Powell, of Marquette, have secured the contract for removing, crushing and loading on cars all the ore above water level at the Helen mine. They have a force of about fifty men at work. They have set up a No. 8 ore breaker, bought of the Gates Iron Works and run by a 250-HP. engine. They are looking for 725 laborers to form day and night gangs.

MINNESOTA.

It is now expected that the Mahoning mine at Hibbing will make a record output of 1,000,000 tons this season. The mine has an open pit covering thirty-three acres, and in some places the ore bed has a depth of 150 feet. Only two benches or levels are being worked at the present time, and neither of them has been cleaned out. The first bench is irregular in depth, but the second is twenty-three feet, and it is from this that most of this season's product will be taken.

Captain Harry Roberts, of Duluth, has bought a one-third interest in the Fay mine, situated just north of Virginia, Minn. The other two-thirds are held by Pickands, Mather & Co.

The owners of the Spruce and Cloquet mine at Eveleth, the Union and Wyoming at Virginia, and the Kimberly, near Virginia, have made contracts by which all their ores will be handled by the Duluth, Missabe and Northern Railroad.

MONTANA.

Stories of wonderful discoveries come from a mine in Confederate Gulch, near Diamond. Christopher Muller and his son Henry, formerly of Champion, Mich., own the property. On one visit to Helena they collected $3,800 from the smelter as the proceeds of four tons of ore. The ore is in narrow seams, sometimes dwindling to a quarter of an inch in width, but in places so rich that they are almost virgin gold. The small amount of quartz in the vein is in strips and nuggets assaying $15 an ounce.

The bond and lease of the Justice mine at Rimini has been taken over by the Helena and Livingston Co. from Davis, Buskett and Hudall. A shaft will be sunk at once, and work will be vigorously pushed to develop the vein, which at present shows an ore chute averaging six feet wide. The ore is of low grade, but the size of the chute will make it pay handsomely.

The Galt Mining Co. held its annual meeting at Neihart on June 27. Reports were presented showing that the Galt mine is employing a force of twenty men, and that a fine showing of ore has been exposed in the shaft seventy-five feet down. W. F. Oden is the superintendent, and Frank Marion and C. D. Ladd are the chief owners.

The Helena Independent is authority for the statement that a scheme is about to be put through involving the development of a number of mines in the Rimini district, the construction of a concentrator and the erection of tramways from ten miles in length to a total length greater than that. The deal depends only upon the success of Eastern capitalists in securing a number of properties to justify the development of some of them, the erection of the plant and the building of the tramways. The plan succeeds one conceived years ago, which included the building of a railroad. The present promoters have cut the railroad out. They feel satisfied that a tramway will be sufficient. The project centers around the initial construction of a tramway from the Lily group, on the Little Blackfoot, near the summit between Ten Mile and the Little Blackfoot. The concentrator and railroad had been projected long before. Owing to the financial disturbances of 1893 the project was held in abeyance. The project is now in better shape than it was formerly, but is said to depend upon the ability of the owners to secure good terms from the owners of properties in that vicinity. There are a large number of propositions of low grade in that vicinity. The leads are large enough, but the grade is low. Surveys have been made for the tramway, and estimates have been made as to the probable cost of the lines and the machinery required.

The Anaconda Copper Mining Co. has placed orders for a large amount of machinery for its new concentrating plant, which will have a capacity of 4,000 tons a day. The order includes twenty-four heavy patented roller quartz mills, twenty-four sets of 40x16 inch crushing rolls with forged steel shells, and twenty-four Blake crushers.

NEVADA.

A persistent rumor is in circulation that John W. Mackay has bought the Silver Peak mine. Although the story is denied officially, there seems to be considerable foundation for the belief that Mr. Mackay will soon be the owner of this property. He has personally examined and sampled the mines, and is fully aware of their richness.

The mill at the Silver Star mine, in Sodaville, has been running on Bounce ore. The owners are opening up the stopes, cutting out stations and doing other work to further the development of this mine, which is believed to be the most valuable in the district.

NEW MEXICO.

Although the Edison experimental placer plant at Dolores is running regularly, none of the persons connected with it can be induced to say anything about its operations. Above the works a high fence has been erected, to serve as a check upon the curiosity of visitors.

A big strike is reported at Rosedale, one of the gold camps of Socorro. The strike was made in the Whitecap mountain.

A good strike of free-milling gold has been made by John Hunter in the Hunter group, in Shingle canon. The formation is granite and porphyry, with an almost entire absence of the lime and iron ore so general in the district.

El Paso men are organizing a company to work a group of copper claims thirty miles from Nogal. D. F. Montgomery is deeply interested in the enterprise, and has already subscribed $10,000 for development purposes.

The Santa Fe Gold & Copper Co., at San Pedro, is now employing about 200 men. By October 1 a new 200-ton smelter will be in operation, and the working force will be increased to 500 or 600.

A force of men is at work near Golden, for the Old Reliable, the Industrial Placer and the Baird Placer companies, driving wells and preparing to erect milling plants to work cement beds.

The Maceo mine, in the Sandinas district, is now owned by F. Giltner, of Las Vegas, and Geo. Ross, of Uhrichsville, O. Development work is being actively pushed. The owners are considering the advisability of erecting a plant of their own for the treatment of the ores.

OREGON.

J. C. Aiken and H. W. Miller, of Roseburg, and others, are developing the Umpaqua group of claims, five miles northwest of Sumpter. Associated with them are J. M. Drennon and W. F. Burlison, well-known miners of the Sumpter district.

SOUTH DAKOTA.

The Cook & Parker cyanide plant at the mouth of Blacktail Gulch, three miles from Deadwood, recently made a clean-up amounting to $800 in bullion after a few days' run. After a year or two of experiments with this process, the owners say that they are now treating ore running only $1 a ton and still make a clear profit of $2 a ton.

The ore is from the Omega mine at Terraville. The success of this establishment is a most significant thing for the future of the Black Hills district, meaning that the cyanide process is to be the salvation of the low grade ore mines.

The large placer mine on Rapid river, in Pennington county, is owned by J. C. Sherman. Mr. Sherman has an open cut thirty feet deep, and raises his placer gravel by an endless conveyor, which enables him to handle several hundred yards of gravel daily. He estimates that the gravel will run fifty cents a cubic yard.

The Detroit & Deadwood Mining Co. has work started on its 200-ton cyanide plant on Annie Creek, and will have the plant in operation by September 15. It will work a large quantity of cyanide ore that will give a profit of $4 to $5 a ton.

John Harlan, general manager of the Portland mine at Cripple Creek, Colo., H. O. Chuet, of Cleveland, O., and several others, recently visited Hill City to inspect the celebrated Blue Lode copper property with the intention of taking a bond on it.

Copper and gold grounds west of Rochford, in Pennington county, are under development by the British-American Gold & Copper Mining Co. and the Black Hills Copper Co. Each company has secured an equipment of machinery, and possesses several hundred acres of mining ground through which well-defined verticals of copper and gold-bearing rock pass. Shafts 500 feet deep will be sunk by each company.

The old Penobscot mine in Custer county has been sold to Denver parties for $30,000. The mine has been closed for nearly twenty years. When it was first worked a bare beginning was made with meagre results.

Northwest of Custer is the North Star, which Eastern people have bought. The shaft is being sunk 500 feet on an eight foot vertical of rich ore. In several localities silverite ore has been found.

Another purchase reported is that of the Grand Junction mine by Montana miners. From the 150-foot shaft, cross-cuts have been run east eighty-one feet to the hanging wall, and west sixty feet in ore. It is said that this is the largest body or low-grade ore in the southern hills, nearly rivaling the Homestake in Lawrence county.

UTAH.

The expense incurred by the erection of a new 300-ton smelter of the Bingham Mining Co. will be paid from treasury cash and from the proceeds of $150,000, 7 per cent debenture notes. The outlook for the Bingham property is considered excellent. Underground developments are all that could be desired, and the work on the new smelter is being pushed in a most satisfactory manner.

It is rumored that the owners of the Johnny mine at Stateline are considering the sale of their property to a London company. Frank Wilson and others who are interested in the Johnny have made a figure for the property which is said to be $300,000 or more. Victor M. Clement, representing a London syndicate, has been in consultation with the owners. Mr. Wilson claims that the Johnny has already exposed ores to the value of about $250,000, and he expresses the confidence that the ore chute is continuous.

Within two months the new aerial tramway between the Mammoth mine and mill will be built. Surveys for the tramway were made by Don B. Gillies. The tramway will have a carrying capacity of 800 pounds to a bucket, and 250 tons a day. The distance from the mine to the mill is 4,800 feet, and the difference in elevation is 350 feet. It is estimated that the work will cost $15,000, and a great saving will be made by the company, which will now be able to handle its entire output at a cost of six cents a ton.

The big smelter to be built by the American Smelting & Refining Co., in Utah, will be located at Murray, Salt Lake county. Surveys will be made immediately, to be followed by the breaking of ground for the foundation, and it is intended that the works shall be ready for operation within a year.

The Humbug recently marketed a carload of ore in Salt Lake City which brought $2,000 to the owner. The consignment was sold on controls, showing values of 400 ounces in silver and $6 in gold to the ton.

The Silver Shield, of Bingham, Utah, has been raising from four to six tons of ore daily, the ore carrying about thirty-five to forty per cent. lead, three to 4 per cent. copper, forty ounces silver and $4 gold.

It seems to be settled that the United States Mining Co. are to have a big smelter at Bingham. The findings made by the expert who recently examined the property show that a good profit can be made on the big bodies of sulphides, and it is claimed that there is enough of this class of ore in sight to keep the plant going for more than ten years. It is said that the smelter will be upon the pattern adopted by the Bingham Copper & Gold Mining Co., and it is expected to be in operation before next spring.

WASHINGTON.

The twenty-third district vein has been struck in the Palmer Mountain tunnel, in the Okanogan district. The last strike shows gold ore assaying from $3 to $37, but the width is yet to be determined. Other veins passed through were from three to thirty feet wide, giving values of from $4 to $40 in gold and silver. The operators will extend the tunnel clear through the mountain, and will postpone drifting until the tunnel is finished.

The tunnel on the property of the Rosalia Mining Co., on Jumbo Mountain, has been drifting in excellent ore. W. R. Ward is the superintendent. He recently said that the tunnel had a depth of over forty feet, and that the face is in good ore similar to that which assays in the shaft from $20 to $40 in gold and copper. The width of the vein is twenty-four inches on the floor, and twelve inches at the top.

A large body of high grade ore has been discovered on the Black Jack, which is located on Gold Hill, two and a half miles from Meyer's Falls. Although this property has been prospected and developed for some time, no paying body was found until recently.

Eastern capitalists, represented by Herbert B. Ives, of New Haven, Conn., have effected the purchase of the California group of O'Brien creek, in the Republic district. The properties will be operated by a corporation known as the Apollo Consolidated Gold Mining Co.

Chas. W. Thompson, president of the Washington Co-operative Mining Syndicate of Tacoma, has issued a circular letter dated July 1 and addressed to the stockholders of the company. He says that since cross-cutting the fifteen-foot vein, the engineers have driven fifty feet to the Surprise vein, which has been continuously showing an unbroken fissure from the mouth of the tunnel. The character of the ore in the mine, Mr. Thompson says, is getting better all the time. Valuable ore is constantly being added to the dump, and the survey for an electric road is now in prog-

Dr. E. Pittwood, of Spokane, has decided to rush development work on the Hardscrabble group, which is owned by the company of which he is president. This group consists of four claims adjoining the celebrated Free Coinage group on Silver creek, seven miles from Sumpter.

The manager of the Quilp mine at Republic has purchased a diamond drill outfit which he will use for exploring purposes on the mine. The ledge through the quartz does not permit of tunneling to a great depth, and so development work on the big vein must be by sinking from the working level by wings, which makes it necessary to hoist the ore from all the lower workings and then through the present main shaft to the dumps. Although the quartz is very hard, it is thought that the diamond drill will make from thirty to forty feet a day.

The Bullion mining claims, eight miles west of Northport on the Columbia river, have been bonded to a party of Indiana capitalists for $42,000, and work is now being carried on to determine the actual value of the property.

WYOMING.

Reports from Battle Lake state that the richest strike ever made in that camp is reported from the Lone Fisherman mine, where at a depth of six feet the vein has been opened showing copper values of 40 per cent., while the shaft, it is said, is a solid mass of mineral. The owners believe they have struck a large body of high grade ore. There is much excitement in Battle Lake, also, over the uncovering of a big dyke of gold, silver and copper-bearing ore south of the town, by three experienced miners who have been prospecting in the vicinity for several weeks. Samples show $51.68 copper, $12 gold and $1.80 silver.

BRITISH COLUMBIA.

At an extraordinary general meeting of the Rathmullen Mining Co., Ltd., recently held in Rossland, it was decided by a unanimous vote to reconstruct the company upon the assessment basis under the name of the Rathmullen Mines, Ltd. The new company will have a capital stock of $750,000, divided into 3,000,000 shares of a par value of twenty-five cents each.

Grand Forks has recently been excited over the remarkable showings of free gold reported from the Iron Horse claim, one mile north of the Deudney trail, in Washington camp. The pay streak occurs in a four-foot ledge and is from three to four inches wide. It is said that the quartz is literally spattered with gold, and that the assays run up to over $2,000 a ton. The pay streak is widening slightly at the bottom of a fifteen foot shaft. The property is owned by James and Patsey Clark, of Spokane; Mrs. G. A. Fraser and Henry Ellis, of Grand Forks.

The York and Lancashire Syndicate has entered the mining field at Nelson, by acquiring through T. G. Proctor a bond on the Ophir mine, situated on Bird Creek. Mr. Proctor has given a contract to P. J. Henry to sink the present shaft fifty feet. Cross-cutting will be begun as soon as that work is finished, with the purpose of establishing the main lead. The ore is of friable, free-milling character. Mr. Proctor has also leased the Drummer property for another syndicate, and extensive preparations will immediately begin on this property.

A company known as the Emily Edith Mine, Ltd., has been organized to operate the Emily Edith claims near New Denver, B. C. The chairman of the company is Beaumont Leather of Leeds, and his associates are Jesse Cooke, Wm. Plews and H. B. Ratcliffe. Chas. E. Hope will be local manager, and J. D. Kendall consulting engineer. The capital of the company, most of which will be held by Englishmen, is £75,000.

It has been definitely decided to increase greatly the capacity of the Northport smelter. This is because of the increased production of the Le Roi and of the expected output of the Le Roi No. 2 and the Le Roi No. 3. The present capacity of the smelter is 650 tons. New batteries of boilers have been ordered and are already on the way, and a new engine is also ordered. The new plant will double the present capacity of the establishment. It is hoped that it will be blown in before the middle of September, and in the meanwhile the ore of the British America Corporation properties which cannot be accommodated at Northport, is sent to Trail.

Chas. Plowman, representing London capitalists, has an option on the property owned by Fletcher Bros., within three miles of the Kalso and Slocan Railway, at Whitewater. After examining the property and making several promising assays, Mr. Plowman started for London with a bag of samples, and he is expecting to inform the Fletcher Bros. in a short time by cable whether the option will be taken.

MEXICO.

There is much interest in Hermosillo and thereabouts over the reports of the discovery of a placer gold field of unusual richness on the Peninsula of Lower California. The new mining district is far removed from settlements and by no means easy of access. It is reported that the fields consist of an area of about 225,000 acres of placer gravel, though more definite confirmation of this report will be demanded before there is any very great movement of population toward the fields.

Adam P. Hanford, of Quincy, Ill., is in Chuichupa, Chihuahua, engaged in the development of a big copper claim.

A rich copper belt has been located in the Sierra Madres, near Carretas, Chihuahua. Samples have shown fifty per cent. copper and considerable gold. A title to the property has been secured by R. Ulrich, of Utah, who will organize a company.

A new company has been formed to work a silver-copper claim near Sabuaripa, Sonora. John L. Milleford, a representative of the company, says that they have a three-foot vein with ore running four per cent. copper and fifteen ounces of silver to the ton.

It is considered likely that in the near future there will be two large smelters at Torreon. One will be built, it is believed, by Torreon, Saltillo and Monterey parties, with a capital of $2,000,000, and the other is likely to be built by Robert S. Towne, president of the Campania Metalurgica Mexicana.

An English company, represented by Pollard & Burnup, has acquired a controlling interest in the San Raymon mine, in the Ocampo district, in western Chihuahua. This mine has for sixteen years been worked by Lewis Harriford, who now

retains an interest in the property and will act as its superintendent. A 15-ton mill will soon be erected at the mine.

The work on the 20-stamp mill and other improvements at the Santa Teresa mine, in the Salmayacan district, is well under way, and in the course of a short time a large force of men will be busy getting out the ore.

Salt Lake mining people have organized a company to develop a group of copper claims in the Guaynopita district, Sonora. The company has a capital of $100,000.

IRON AND STEEL

THE CARNEGIE FREIGHT YARDS: The Carnegie Co. is extending the freight yards of its Homestead works to provide storage for 2,000 additional freight cars. The extensions will give the company the most extensive private freight yards in the world. It is doubtful whether many of the biggest railroad companies have larger yards.

NEW STEEL BARGES FOR THE MONONGAHELA: Jones & Laughlins, Ltd., of Pittsburg, are to have a new fleet of steel barges to be used in hauling slag and steel from their furnaces. The barges will be towed with cargoes of slag in the lowlands along the river bank owned by the company. On their return trips they will carry coal and limestone to the company's works.

A RECORD PAYROLL: On July 14 $250,000 was distributed to the employees of the Edgar Thomson Steel Works of the Carnegie Steel Co. at Bessemer, Pa. This is the largest payroll in the history of the plant. The workers are getting the benefit of the increased price of steel rails and the sliding scale of wages. The pay was at the rate of $33 a ton. A year ago the men were paid on the basis of $22.

QUIET TIMES AT BELLEFONTE: The big furnaces at Bellefonte, Pa., operated by the Empire Iron & Steel Co. and the Bellefonte Furnace Co., are closed down at present. No date is set for the opening of the former, while the latter will reopen as soon as repairs, aggregating $35,000, have been made. These furnaces have a capacity of 100 tons a day each. As a result of the shutdown of the furnaces, the ore banks in the vicinity are idle and 600 men are out of work.

WAUKEGAN, ILL., MILL REOPENED: The American Steel & Wire Co. has resumed operations on its big wire mill at Waukegan after a long shutdown, caused by last fall's fire. The number of men at work was small at first, but will be greatly enlarged. One mill at the rolling mill which was closed a short time ago has also been reopened, with day and night gangs at work, and other developments will be started in quick succession until the factory is once more running at full blast.

AMERICA'S LARGEST HOME - MADE FREIGHTER: The "American," the largest ocean freight steamer ever built in this country, was launched at Roach's shipyard, in Chester, Pa., on July 14. The American is 425 feet over all, fifty-one feet beam and thirty-four feet and six inches depth of hold. The gross tonnage is 6,000 tons. She will have two pole masts and two derricks, seven water-tight bulkheads and three decks, and will be driven by a vertical triple-expansion engine. She is being made for the American Hawaiian line.

TAUNTON'S FIRST ELECTRIC LOCOMOTIVE: On July 7 the Taunton Locomotive Mfg. Co. shipped the first electric locomotive built in Taunton. The machine was for the Whitin Machine Co. of Whitinsville, Mass. The Taunton Co. has made a study of the subject of erecting locomotives with power furnished by storage batteries. Its pioneer engine will be used in moving freight cars in the yards of the Whitin Machine Co., and it is thought that it will be much cheaper than to hire the switching done by the railroad companies.

BRAEBURN STEEL CO.: This company, at Braeburn, Pa., twenty miles from Pittsburg, has made important additions to its equipment, which will greatly increase its capacity in the manufacture of crucible tool steel and open-hearth steel. The plant is being run on full time at present, and steel is being shipped as rapidly as made. The plant is constructed on a most economical basis, and is so arranged that all raw material is brought in at one end and finally leaves the building through the other end in finished form without rehandling.

IRON EXPORTS TO ENGLAND: The English iron market has not shown the same decline that our overproduction has precipitated, and there is little slackening in the demand for pig iron at Birmingham and other British centers. If the present disparity in prices continues, substantial shipments of American iron will undoubtedly be made to England. In fact, a well-known Glasgow merchant, who recently negotiated in person on this side with some of our iron masters, is said to have made definite engagements here for considerable supplies.

TEST OF RUSSIA'S ARMOR PLATE: On the proving grounds of the Bethlehem Steel Co. the first test of Bethlehem armor plate now being made there for Russia was held a few days ago. The plate tested was the Krupp process plate, curved for use as the turret armor of the Russian battleship Retzivan, now being made by the Cramps. Four 250-pound projectiles were fired from an eight-inch gun with velocity ranging from 1,968 to 2,088 feet a second, and the greatest penetration noted in the plate was two and three-eighth inches and the least one and one-half inches.

BUSY TIMES AHEAD FOR LAKE SUPERIOR: Iron Ore of Ishpeming, Mich., says: "While there is considerable talk of curtailment in the iron mines of the Lake Superior district, there will have been twenty million tons of ore sent from lake ports and by all-rail at the close of navigation the coming fall. Shipments are nearly forty per cent ahead of a similar period last year. There has been a tying up of some of the big boats of the Rockefeller fleet, but the high lake rate has brought in some of the vessels which have been out of the ore-carrying trade for several seasons. The lumber rates have fallen, too, so that a million or more tons will be carried by this class of freighters. It is safe to say that the boats will be able to handle all the ore the consumers will need until the spring of 1901, and that the total will exceed twenty millions.

A CHEERFUL VIEW FOR THE FUTURE: Rogers, Brown & Co., whose market letters on the iron market have come to be recognized as among the most able criticisms on the situation from week to week, say in a late report: The shock of the dreadful news from China tends to delay the change of sentiment that was about ripe. There is an accumulation of favorable factors of enormous proportions; they are well known, but have been persistently ignored. Some day we will look at them, we will discover that our wheat crop after all will bring more money to the country than last year's; that the corn and cotton crops will sell for more than ever before; that there is no stopping our colossal growth of exports; that, after six months of imagined depression, our railroad earnings and bank clearances (speculation aside) are still the greatest in our history; in short, that we can safely go on building, developing our vast resources and using iron as before.

ALABAMA EAGER TO RESUME OPERATIONS: A late dispatch from Birmingham says: The pig iron market in Alabama is still very quiet, with no hope for immediate improvement. The furnace men believe that the bottom figure has been reached, and that the quietness is due to politics. The export movement, also is improving a little, some good orders to be delivered in the very near future. Nothing definite is given out as yet concerning the rolling mills of the Republic Iron & Steel Co., as to when they will resume operations in this section. The news that the Republic Co. had signed the scale for their mills in the Pittsburg district gave the people hereabouts some hope that the same would soon be the fact here, but so far nothing definite is learned in that line. All work of repairing on furnaces in this district is being kept up, and there are three or four furnaces which will shortly be in condition to be fired up when the operators so desire.

STEEL RAILROAD TIES: With the heavier rails, larger engines and cars, and other severe conditions of service now imposed on railroad ties, it is natural for engineers to consider the replacement of the old wooden sleeper with something more in keeping with modern traffic. The question is highly debatable, and plenty of engineers still favor wood without regard to considerations of cost. More or less experimentation is going on with steel ties, and some expert railroad managers are already convinced that steel ties are destined to come into permanent favor. One such tie in actual use to-day on the Huntington and Broad Top Ry. (Pennsylvania) weighs about 110 pounds and costs somewhat more than $3. In large quantities, these same ties could doubtless be made for much less than this. Advocates of the tie contend that it keeps the track more accurately and persistently in line and surface, and at the same time cuts down the cost of track maintenance nearly one half.

INTERNATIONAL STEEL COMBINE: It has been reported in New York that there is to be a general international conference of steel and iron manufacturers in London during the first week of this month to consider the question of maintaining an international price list. The presence of Judge Moore, James B. Dill, John Lambert of the American Steel & Wire Co., John W. Gates, of the same company, and Andrew Carnegie, in England just at the present time, has given a certain amount of color to the report, but none of the officials of the companies in New York could confirm the story yesterday. The reason given in the report as to the necessity of such a conference, was that in those countries where all the steel and iron companies were competing for trade it was found that some of the European concerns were cutting prices below those asked by the American companies. It was also stated that the American firms were particularly anxious to get an international schedule of prices, for the reason that in case the tariff here was to be taken off some of the products they would still be in a position to control the domestic business. In the case of the American Tin Plate Co., it was pointed out that, if the tariff was to be taken off, the English manufacturers, as well as the Germans, would be able to come into the domestic competition most effectively. The object of the conference, it is stated, is, therefore, to obtain, if possible, from the European concerns some protection against such a possible turn of affairs.

PENNSYLVANIA'S IRON PRODUCTION: At the meeting of the National Association of Labor Commissioners in Milwaukee, a few days ago, James W. Clarke, Chief of the Bureau of Industrial Statistics of Pennsylvania, presented the following interesting figures showing Pennsylvania's production of iron, steel and tin for 1899:

Pennsylvania in 1899 produced 6,542,998 gross tons of pig iron, or more than seventy per cent. of the entire production of Great Britain, over forty-eight per cent. of the production of the United States, and over ninety-four per cent. in excess of her production in 1894. Pennsylvania produced 6,446,159 gross tons of steel in 1899, being nearly twenty-nine per cent. in excess of the entire production of Great Britain, over sixty per cent. of the production of the United States and over one hundred per cent. in excess of her production in 1894. Forty-six per cent. more steel was produced in Pennsylvania in 1899 than was produced in the entire United States in 1894. Pennsylvania in 1899 produced 7,093,435 net tons of rolled iron and steel, not including steel billets or muck bar. This was over fifty-nine per cent. of the entire production of the United States, and over 132 per cent. in excess of her production in 1894. Pennsylvania alone rolled in 1899 over thirty-four per cent. more iron and steel than was rolled in the entire United States in 1894.

The United States in 1899 produced of tin and terne plate 435 per cent. in excess of the production in 1894, Pennsylvania producing thirty-seven per cent. of this increase.

COAL AND COKE

PENNSYLVANIA VS. MARYLAND: The Baltimore World accuses Pennsylvania coal operators of contributing to the funds necessary to prolong the strike in Maryland, charging that this is done that the Pennsylvania mines may profit at the expense of the Maryland fields. This charge has attracted considerable attention, and an investigation has been demanded. Certain Pennsylvania mine owners have been singled out as especial objects of suspicion.

A MONTANA COAL DISCOVERY: Dr. F. Remington, of Helmville, Mont., is reported to have discovered what promises to be an immense body of anthracite coal on one of the tributaries of the Big Black Foot river. A shaft has been sunk, which shows the coal measure to be overlaid with twenty-eight feet of oil shale. The formation is similar to that in the Scranton coal fields in Pennsylvania. Dr. Remington hopes to complete arrangements for working the property extensively.

TEST OF MEXICAN COAL: The development of the new coal fields of the Southern Pacific Co. at La Barane, Hermosillo, Mex., has begun on an extensive scale. Several months ago the company sent 1,000 tons of the coal to Sacramento, Cal., for the purpose of testing it thoroughly before definite steps were taken toward developing the mines. This test resulted satisfactorily in

every particular. The company will build a railroad ninety-six miles long to connect the Sonora branch of the Southern Pacific with the coal fields.

GOOD REPORTS FROM RANDSBURG, CAL.: It is said in Randsburg, Cal., that the coal beds fifteen miles west of that place are rapidly improving in quality as development proceeds. Shortly after work was commenced on the deposits a two-foot ledge of coal was struck at a depth of fifty feet, but the coal was impure and soft, and unsuited for any purpose. Twenty feet further down another ledge was found of a better quality, but still rather poor. Further developments opened up a twenty-five-inch vein of excellent quality, which has inspired the company to proceed further.

UNITED STATES COAL FOR BRAZIL: Minister Bryan writes from Petropolis, June 1, 1900, that in response to a note to the Brazilian Foreign Office, requesting information as to a contract for furnishing pit coal to the Central Railroad of Brazil, he has been informed that there is no doubt that United States coal will be used if it is of superior quality to coal already presented for trial. A copy of the last contract, with specifications, was sent Mr. Bryan and will be transmitted by him and made public as soon as received. The opportunity seemed so favorable to the minister that he sent notice in advance, without waiting to translate the specifications.

DUTCH DEMAND FOR COAL: Consul Harris, of Mannheim, under date of May 19, 1900, writes to the State Department: "I have to advise the Department that I am receiving frequent request from local coal dealers and manufacturers for prices of American coal on board ship at Rotterdam. These inquiries are from responsible parties and relate both to anthracite and bituminous coal. The people in this consular district are watching with intense interest the introduction of American coal. All prices for this market should be quoted f. o. b. Rotterdam. I have promised to ascertain approximate prices for parties here and shall be greatly obliged for information touching the matter, with names of shippers from most available point for this market."

VANCOUVER ISLAND COAL: G. A. Macdonald, of the firm of G. E. Macdonald & Co., agents for the Dunnsmuir collieries, has received a flattering letter from the secretary of the Bellingham Bay Iron Works concerning its experiences with the Vancouver coke furnished by Macdonald & Co. Mr. Allen, the secretary, says that the coke gives excellent satisfaction, and that his company considers it the best on the coast. Wherever Vancouver coke comes into competition with coke from other sections it is said that it has been found to give unusual satisfaction. Much of it goes to the Kootenays, where it is used in foundries and manufacturing establishments. Although it is only recently that coke has been made in British Columbia, the Comox coke is already famous.

CAPE BRETON'S ENORMOUS COAL PROPERTY: Arthur S. Leland, of the firm of A. S. Leland & Co., of Boston, has just visited the properties of the Dominion Coal Co. and the Dominion Iron & Steel Co., Ltd. He says of what he saw there: "I was informed that for the year ended March 1, 1893, the output of the Dominion Coal Co. amounted to 826,208 tons of coal; for the year ended March 1, 1900, the output was 1,739,000 tons. Over 4,000 hands are employed in the mine now, and Mr. Whitney wants 1,000 more men immediately. The company's payroll in 1892 was $600,000 a year; last year it was $1,333,000. I went down in the mine called the Dominion Reserve, which is producing an excellent quality of steam coal. Three hundred men are employed here at night and 300 during the day. The same number of men are employed in Caledonian mine night and day. The Dominion Iron & Steel Co. has $10,000,000 of stock and $5,000,000 of bonds outstanding. Two blast furnaces are in process of construction at a cost of $750,000 each, and two more are in contemplation."

STATISTICS FROM CONNELLSVILLE: The The Connellsville Courier, the recognized authority on coke statistics in Pennsylvania, says that the output of the Connellsville region for the first half of the present year indicates that the unprecedented record of 1899 will be easily outstripped in 1900. The output of the first four months of the present year averaged 11,500 cars per week, or nearly a million tons per month But the boom had then reached its highest mark. The iron and coke trades are familiar with the reaction which then followed upon the stock jobbing operations of a prominent steel magnate. Iron prices sagged and production was quickly curtailed. Thirty furnaces went out in the Mahoning and Shenango valleys alone, cutting down Western coke shipments from an average of 6,072 cars per week for the first four months of the year to 4,977 cars per week for May and June. During the same period the average shipment to the Pittsburg district fell from 3,284 to 2,779. Eastern trade, while it shows considerable fluctuations from week to week, maintained a steady average of about 2,100 cars until last month when it experienced a slight falling off. The full extent of the slump in trade is shown in the fact that the total shipments of the past two months averaged only 9,840 cars per week as against 11,478 cars per week for the first four months in the year.

The total output of the region for the first four months of the year aggregates 5,746,252 tons and indicates an output for the year, at the present rate of production, of about 11,000,000 tons, or nearly a million tons more than that of 1899.

NEW INCORPORATIONS

The name, address and capital stock of corporations recently announced and the name of one incorporator. Unless otherwise specified, companies are organized to conduct a mining business. Address of the incorporator named is same as that of company, except when stated otherwise.

COLORADO.

MENONA MINING & MILLING CO., Allegheny; $50,000; A. Miner.

SANGRE DE CRISTO MINING CO., Monte Vista; $1,000; H. V. Smith.

PEACOCK MINING, MILLING & LEASING CO., Colorado Springs; $200,000; C. H. White.

ROUGH RIDER MINING & MILLING CO., Denver; $100,000; J. W. Stephens.

UTICA GOLD MINING CO., Denver; $1,500,000; P. A. Primean.

CANDELARIA MINING & EXPLORATION CO., Colorado Springs; $2,000,000; T. H. Jones

NEW CENTURY GOLD MINING CO., Cripple Creek; $1,500,000; C. N. Miller.

WORKING BOY GOLD MINING & LEASING CO., Victor; $20,000; D. J. Carlon.

LUNONITE DEEP MINING & TUNNEL CO., Denver; $1,500,000; H. H. Baldridge.

CENTRAL HILL DRIFT MINING CO., Denver; $12,000; Pierre C. Moffitt

THE BONANZA CITY DEVELOPMENT CO., Parkville, Colo.; Richard Seybold.

MUTUAL CAPITAL MINING & MILLING CO., Pueblo; $60,000; J. W. Tanner.

GOLD CONSOLIDATED MINES CO., Cripple Creek; $1,350,000; W. J. Davenport.

CLEAR CREEK GOLD MINING & INVESTMENT CO., Georgetown; $10,000; C. C. Dill.

DELAWARE.

KANSAS & MISSOURI INVESTMENT & MINING CO., Wilmington; $500,000; J. K. Hudson, Topeka, Kan.

ILLINOIS.

SPRING CREEK MINING & MILLING CO., Chicago; $10,000; E. C. Kimball.

EXCELSIOR COAL CO., Chicago; deal in coal and fuel; $15,000; T. J. Rayeroft.

INDIANA.

THE A. B. C. MINING CO., Indianapolis; $3,000; G. J. Marott.

SEELEYVILLE COAL AND MINING CO., Seeleyville; develop and operate coal mines; $10,000; W. W. Ray.

MIDLAND COAL CO., Midland; $100,000; W. N. Showers.

IOWA.

BLACK HAWK MINING CO., Waterloo; operate lead, zinc and other mines; $50,000; George Carey.

GRACE E. MUTUAL MINING CO., Red Oak; $14,000; W. Boll.

MAINE.

GOLD KINGS CONSOLIDATED MINES CO., Waterville; mining, manufacturing mining machinery; $6,000,000; E. W. Beyer.

MINNESOTA.

IDAHO COPPER MINING & SMELTING CO., Minneapolis; $1,000,000; G. A. Wall.

CROSS LAKE GOLD MINING CO., St. Paul; $1,000,000; F. E. Elmund.

MISSOURI

SANGO MINING CO., St. Louis; $60,000; F. B. Tait.

NORWOOD MINING CO., Carterville; $100,000; W. B Kane

WYOMING MINING & MILLING CO., Granby; $20,000; T. A. Wright, Wilkesbarre, Pa.

NEW JERSEY.

MONTANA COAL, IRON & COKE CO., Camden; $4,500,000; R. C. Ellis, Philadelphia, Pa.

OHIO.

FOX MINING CO., Massillon; $100,000; J. M Drake.

MONARCH MINING CO., Akron; $250,000; J. P. Loomis.

TIPPECANOE COAL CO., Cleveland; $50,000; S Parks.

PERRY OIL CO., Lima; $10,000; W. T. Hoaps

NICE COAL CO., Big Run; $10,000; J. A Rowan.

OHIO & KENTUCKY LEAD MINING CO., Columbus; $10,000; W. S. Cason.

THE VICTOR OIL, GAS & MINING CO., Mount Victor; producing oil, gas and coal; $50,000; Isaac J Wilson.

OREGON.

ELK CREEK GOLD MINING CO., Union; $50,000; T. B. Johnson.

LILLIAN GOLD MINING & INVESTMENT CO., Baker City; $500,000; W. A. Settle.

COPPER CREEK MINING CO., Portland; $250,000; J. A. Cofelt

KEYSTONE BELLE & GOLD BOY CONSOLIDATED MINING CO., Baker City; $2,000,000; W. Smith.

PENNSYLVANIA.

MARINE COAL CO., Pittsburg; $200,000; A. L. Wallace.

RIVER COAL CO., Pittsburg; $1,000; F. B. Davenport.

TEXAS.

YORKTOWN COTTON OIL CO., Yorktown; $35,000; J. B. Hollingsworth.

TAYLOR MINING CO., Taylor; mine for gold and silver; $5,000; P. M. Woodall.

TIMSON COAL CO., Timson; $50,000; C. W. Tandy.

SAN ANTONIO BRIQUETTE & COAL CO., San Antonio; $150,000; W. H. Baugh.

DALLAS PETROLEUM CO., Corsicana; prospect an develop oil, coal and other mineral products; $10,000; R. E. Prince.

WASHINGTON.

HOSIER MINING, MILLING & DEVELOPMENT CO., Loomis; $1,500,000; J. Boyd.

CANADIAN KING MINING CO., Spokane; $75,000; C. K. Merriam.

HARRINGTON MINING & REDUCTION CO., Seattle; $1,000,000; B. C. Johnston.

PACIFIC OIL WELLS CO., Tacoma; $250,000; M. D. C. Spiki.

WEST VIRGINIA.

CLINTON OIL CO., Pittsburg, Pa.; $100,000; H. T. Friend.

NORTHWESTERN MINING CO., Charleston; $2,500,000; A. F. X. Anthony, Cleveland, O.

NEW GLENDALE COAL CO., Wheeling; $300,000; H. V. Brandenburg, New York city.

AGASSIZ MINING CO., Boston, Mass.; $250,000; J. McLean.

HAMILTON OTTO COKE CO., St. Clair, O.; $500,000; F. L. Garrison, Covington, Ky.

ALASKAN MINING CO., Nome City; $800,000; E. E. Gaines, Citra, Fla.

MONON OIL CO., Fairmont; general oil and gas business; $200,000; W. S. Stevenson.

JUPITER STEEL & COKE CO., Pittsburg, Pa.; $1,000,000; James Hazelwood.

THE CAMERON GAS & OIL CO., Cameron, W. Va.; general oil and gas business; $500,000; J. W. Dunlery.

LOS SAUCES MINING CO., New York city; $300,000; C. F. Frothingham.

CONSOLIDATED MINING & DREDGING CO., Pittsburg, Pa.; $300,000; P. Hart.

TULARE ZINC CO., Springfield, Mo.; $150,000; E. Sampson, Martinsburg.

CUSHING ZINC SMELTING CO., Joplin, Mo.; $600,000; S. S. Rapp, Brooklyn, N. Y.

FIRE CREEK COAL & COKE CO., Fire Creek; $200,000; J. M. Miller, Staunton.

WORCESTER TANGIER MINING CO., Worcester, Mass.; $500,000; W. W. Johnson.

MINING STOCK QUOTATIONS IN VARIOUS MARKETS

Mining stocks multiply incessantly, and we cannot undertake to record them all. We keep, however, complete records of all mining stocks, wherever listed, and we shall be glad to furnish any subscriber, on request, with detailed information about quotations. The prices given below are in most cases those current at the close of business on the day we go to press—two days before the date of issue.—*Mining and Metallurgical Journal.*

BOSTON.

Adventure	2 00	Old Colony Cop	3 00
Allouez	1 25	Old Dominion	10 00
Amalgamated	12 00	Osceola	72 00
Arcadian	2 00	Parrot	42 00
Arnold	1 75	Quincy	137 50
Atlantic	24 00	Rhode Island	4 00
Bonanza	18 50	Santa Fe	5 00
Boston & Mont	393 00	Santa Maria	1 00
Butte & Boston	90 00	Tamarack	100 00
Bonanza Mont	393 00	Tecumseh	—
Butte & Boston	90 00	Tri Mountain	7 00
Calumet & Hecla	474 00	Victoria	1 50
Centennial	17 00	United States	—
Cle Elum	8 00	Utah Con	28 50
Copper Range	13 00	Washington	16
Dominion Coal	48 25	White Knob	15 00
Franklin	14 50	Wolverine	3 00
Isle Royal	27 50	Wolverine	38 50
Mineral	5 00	Wyandotte	1 25
Mohawk	10 50	Zinc	10 00

NEW YORK.

Adams Con	18	Golden Fleece	35
Alamo	15	Gould & Curry	20
Amo	30	Hal & Nev Con	20
Amalgamated	85 75	Horn Silver	1 15
Anaconda C	10 68	Iron Silver	52
Arnold Con	42	Lead Silver	1 27
Arapahoe	28	Mexican	51
Belcher	20	Ophir	91
Best & Belcher		Potosi	13
Brunswick	10	Sandy Con	05
Caledonia	50	Seg Belcher	02
Challenge	10	Sierra Nevada	28
Chollar	15	Silver Hill	45
Con Cal & Va	1 50	Standard	4 20
Con Imperial	01	Union Con	18
Crown Point	12	Utah Con	09
Exchequer	03	Yellow Jacket	20

Standard	4 00	Utah	09
Tornado	—	Victor	—
Union	41	Work	32
Union Con	17	Yellow Jacket	10

NEW YORK INDUSTRIAL STOCKS

Amer Smelt	37 75	Nat Lead pf	97 25
Am Smelt pf	89 00	Pressed Car	14 50
Am. S. & W.	56 50	Pressed Car pf	44 00
Am. S. & W. pf	74 50	Republic I.	12 50
Col F & I	35 50	Republic I pf	54 50
Fed Steel	45 00	Standard Oil	645 50
Fed Steel pf	68 00	Tenn C & I	74 00
Nat. Lead	20 25		

TORONTO.

Athabaska	28	No. Belle	—
Big Three	02	Olive	10
B. C. Gold Fds	03	Rambler	30
Crow's Nest	30 50	Van Anda	02
Dardanelles	02½	Virtue	03
Deer Trail No. 2	05	War Eagle	1 60
Fairview	04	Waterloo	03
Golden Star	09	White Bear	01¾
Knob Hill	43	Winnipeg	09¾
Minnehaha	01¾		

COLORADO SPRINGS.

Acacia	30	Independence	40
Alamo	15	Ingham	20¾
Anaconda	41¾	Isabella	1 20
Anchoria	60	Jack Pot	51
Argentum	26	Keystone	18½
Bankers	17	Lexington	17¾
Battle Mount	28¾	Mary Cashen	20¾
Blue Bell	11	Matoa	30
C. C. Con	13¼	Moon-Anchor	60
C. C. & M	12¼	Mount Rosa	75
Columbine	14¾	National	11½
Damon	21	Nugget	23
Dante	12¾	Ophir	50
Elkton	1 40	Orphan	19
El Paso	42¾	Pharmacist	14
Findley	14¼	Pinnacle	20
Garfield	15	Raven	—
Gibson	25	Rawlings	21
Gold Coin	6 50	Specimen	—
Golden Fleece	30	Tomonj	—
Gold King	1 27	Tornado	—
Gold Knob	15	Union	41
Gold Sover'gn	10	Vindicator	1 47
Gould	40¾	Work	30
Hurt	15	Zenobia	15

SALT LAKE.

Anchor	35	Joe Bowers Ex	08
Ajax	60	Low, Mam'th	52
Alice	50	Lucky Boy	04
Bullion Beck	165	Mammoth	2 40
Cent Eureka	21 50	Mercur	5 50
Chief Con	08	May Day	01
Dew	4 35	North Eight	01
Daly West	16 00	Omaha	—
Dalton & Lark.	03	Ontario	6 25
Dalton	03	Petro	20
Dexter	80	Rich Arcanda	25
Dolly	02	Sunshine	50
Eagle	—	Swansea	4 00
Eagle & Blue Bell	77	So. Swansea	1 18
Emerald	05	Sunbeam	03
Four Aces	02	Sacramento	23
Grover Morton	05	Silver King	15 00
Galena	15	Star Consol	28
Grand Central	5 70	Shower Con	10
Golden Eagle	01¾	Tetro	03¾
Horn Silver	1 20	Utah	32½
Homestake	07	Valeo	25
Ingot	03	W. M't'n Placer	03¾
Joe Bowers	05	Yankee Con	09¾

SPOKANE.

Ben Hur	—	Morning Glory	03
Black Tail	14	Mountain Lion	05
Butte & Boston	02¾	Pearl	—
Deer Trail No. 2	05	Princess Ma'de	03¾
Golden Harv'st	01¾	Quilp	17¾
Insurgent	01	Republic	90
Jim Blaine	12½	Tom Thumb	19¾
L. Pine Sur. Con	10		

SAN FRANCISCO

Alpha Con	07	Kentucky Con	01
Alta	07	Lady Wash Con	02
Andes	04	Mexican	15
Belcher	13	Occidental	07
Best & Belcher	20	Ophir	91
Bullion	02	Overman	09
Caledonia	75	Potosi	13
Challenge	13	Sag Belcher	02
Chollar	15	Savage	11
Confidence	65	Sierra Nevada	25
Con. Cal. & Va.	1 45	Standard	4 20
Con. Imperial	01	St. Louis	15
Crown Point	12	Syndicate	08
Gould & Curry	22	Union Con	18
Hale & Norcr'ss	20	Utah Con	09
Julia	01	Yellow Jacket	20
Justice	09		

MEXICO.

Name of Company.	State	Price
Amistad, Concordia	Hidalgo	1 50
Aqua Dulce	Guanajuato	140
Arevalo y Anexas	Hidalgo	200
Asturiana y Anexas	Zacatecas	175
Bonanza de Cobre	Durango	30
Bueno Suceso Mexico	Hidalgo	07
Cabrera y Ay	Zacatecas	10
Candelaria de Pinos	Durango	225
Caporaya	"	12
Carmen	Hidalgo	250
Cinco Senores y An	Guanajuato	330
Concepcion y Anexos	S. Luis Potosi	270
Consuelo	Mexico	75
El Oro	Guanajuato	—
El Oro pref	Guanajuato	—
Esperanza y An	Mexico	1,200
Gloria	Chihuahua	
Guadalupe	Guanajuato	205
Luz de Borda avaido	Michoacan	11
Luz de Maravillas	Hidalgo	100
Pabellon	"	30
Palma de Bomb	Zacatecas	50
Pinoles	Durango	
Rafael y Anexos	Hidalgo	750
Real del Monte	Hidalgo	750
Restaurndora	Durango	20
Rosario y Anexas	Durango	
San Francisco	Hidalgo	145
San Rafael Avindo	Hidalgo	120
San Rafael Pinos	Hidalgo	
Sta. Maria de la Paz	S. Luis Potosi	805
Soledad	Hidalgo	280
Sorpresa	"	270
Trinidad Aviador	Guanajuato	05
Trinidad Aviado	Guanajuato	15
Tlauzingo	Puebla	—
Union Hacienda	Hidalgo	230
Zona Min. de Paz	Guanajuato	8

NOTE—Mexican stocks are figured on the basis of Mexican silver.

THE METAL MARKETS

The following quotations are those current in New York City, unless otherwise stated, at the time we go to press—usually two days before the date of publication. We take particular pains to obtain trustworthy figures.—The Mining and Metallurgical Journal

SILVER: Although the recent persistent advances in price have been substantially maintained, the market of late has somewhat sobered in tone. It was hardly to be expected that the phenomenal strength characteristic of quotations for several weeks in succession should continue indefinitely. The situation, however, still favors the holders of bullion. British exports to India up to date this year exceed those of last year twenty per cent, and similarly large shipments have been made to other Oriental countries. Yet the demand from the East is as urgent as it has been at any time, and apparently sellers may count upon an excellent market there for months to come.

Our latest quotation for commercial bar silver was 61¼, and for Mexican dollars 48½.

COPPER: This column has from the first consistently combated the theory, rather strenuously maintained in some quarters, that copper must go the way of other metals and suffer severe declines in value. Such a view has the support of analogy, and it cannot be denied that speculation has played a certain part in holding up copper quotations. But the "bulls" have had Nature on their side, and the basic facts have been with them. They are still with them, so far as we can see, and in our judgment the talk of "liquidation" in copper and a sudden descent to old-time prices is nonsensical. Our copper production for the first six months of the year increased 10,000 tons, or eight per cent over last year, while our exports in the same period increased nearly one third. The foreign demand for American copper is insatiable, and we are now exporting regularly two-thirds of our total production.

Our closing price for Lake copper is 16½c., with the market quiet but firm.

MINOR METALS: Tin has moved up sharply since our last issue, and it is clear that some one has the market under extraordinarily close control. Spot tin commands 35c., while deliveries only a week delayed are offered at 33½c. Consumers have only themselves to blame for this condition of things, since they have permitted their stocks to run so low that the market manipulators have them at their mercy.

Lead remains about where it was when we last reported, the closing quotations ranging from 3.97½c. to 4.02½c. The market is quiet and lifeless, neither side taking an aggressive stand at present.

Spelter calls for the same kind of comment. The self-denying conduct of producers in limiting the possible supply by curtailing their operations has had a sentimental effect at least, and the general feeling about prices seems to be hopeful. Our last quotation was 4¼c.

IRON AND STEEL: If the tide in this market has not definitely turned, it is at least true that the waves are no longer visibly receding. A fair tonnage in steel bars and plates, and numerous, if small, orders for pig metal, have been booked of late; and buyers are not now, as a rule, holding utterly aloof from the market in complete confidence that lower prices will prevail. They have no fear for the future, but they see that bottom is near at hand everywhere and actually reached in some places. The best thought on the subject seems to be that prices will fluctuate but little from their present level during the next few weeks, but that a general upward movement will begin before the summer is over, and will gradually gather headway in the early autumn. It is confidently predicted by seasoned and conservative representatives of the industry that the fall trade will be excellent, as regards both volume and prices.

COAL AND COKE: The output of anthracite coal in June was 500,000 tons more than that of the previous year, and the figures for July will also, it is thought, disclose considerable advances. The coal is going to consumers no faster than is usual at this season, and the unusually large tonnage must be accumulating in the yards in former years this condition of things would unquestionably have led to cutting and more or less "demoralization," but under the existing conditions of unified and harmonious management it is commonly believed that prices will be well maintained. Present list prices, f. o. b. New York Harbor, not to the trade, are $4 for stove and chestnut, and $3.75 for egg; actual selling figures, in some cases at least, are thought to be about ten per cent under list prices.

The Bituminous branch of the industry is reasonably prosperous, though the conditions are not uniformly good. The George's Creek strike still drags its slow length along, with no end clearly in sight. Clearfield coal commands about $2.50 per ton at New York Harbor ports.

The production of Coke continues to fall off, and the price keeps step with production. Foundry coke sells for $2.25@$2.50, and furnace for $2.25 and even less. No marked change for the better is expected until general conditions in the iron market improve.

DIVIDENDS DECLARED

The Daly-West Mining Co. has announced its regular quarterly dividend of twenty-five cents a share, payable July 16. This means a disbursement of $37,500, making in all $287,500 paid out to its stockholders since the first of the present year, and $120,000 since October.

A semi-annual dividend of three and one-half per cent. on preferred stock, payable July 26, is announced by the Huntingdon & Broadtop Mountain Railroad & Coal Co.

The Pittsburg Coal Co., of Pittsburg, Pa., has declared a dividend of one and three-quarters per cent. on preferred stock, payable July 25.

The stockholders of the Pueblo Smelting & Refining Co. have received a final dividend of $37.15 a share, bringing the total distribution to stockholders, in the winding up of the company's affairs, to $312.15.

The Boston & Montana Copper Mining Co. declared a $10 dividend on July 14, which brought the total dividend distributions of the company up to $18,725,000. The directors are expected to declare a dividend of at least $12 a share in November, making $40 for the year 1900.

DEMAND FOR COAL IN BELGIUM: Consul Brundage writes from Aix la Chapelle that he has had an interview with Henri Coopman, a coal dealer of Verviers, Belgium, who purchases annually 200,000 tons of coal, and who expresses an urgent desire to be informed of prices and ability to deliver American coal at Antwerp, Belgium. Consul Brundage says that agents of bituminous coal, semi-bituminous and semi-anthracite seeking foreign markets should at once correspond with him, quoting prices and analyses.

WANTED

Advertisements of this class containing not more than five lines will be inserted for not exceeding three months in any year, free of charge, for all paid-up annual subscribers.

Other than above, 20 cents a line.

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ASSAYERS AND MINERS to correspond with us in regard to Minerals and Crystal Groups for Cabinets. Best prices paid for fine cabinet specimens.
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WANTED.—Position as superintendent by pushing and up-to-date mining engineer, who understands all branches of mining and milling gold ores. Has his own assay outfit, and would be willing in a small mine to do the assaying and surveying. Address,
D. P. A., Mining and Metallurgical Journal Office.

CHEMIST, age 31, with University training and excellent references, desires position with mine or smelting works.
Address J. W. FELL,
Asheville, N. C.

AN EXPERIENCED assayer and bullion refiner with the best of references, several years' experience, and a university training, desires employment with some mining company. HAROLD FRENCH, Los Angeles Office, M. & M. Journal.

EXPERT hydraulic and steam engineer, experienced in transmission of power by electricity, desires position (Colorado or Montana preferred) as superintendent of mining power plant. Address,
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A MINING engineer, with camping and assay outfit, would be glad to join a prospecting party on reasonable terms. Address, PROSPECT, Mining and Metallurgical Journal Office.

WANTED: PARTNER or Co. to open coal mine near RANDSBURG. Three veins, the third being nine feet, four feet solid coal, 101 feet from surface. Two first viens opened with shaft. 1,600 acres discovered along the rim of field.
F. H. HEALD, Randsburg, Cal.

ENGINEER and Metallurgist of long experience, fearless, energetic, trustworthy, seeks position; managing, erecting, reporting or developing. Speaks French, German, Spanish and excellent Chinese. Exceptional testimonials. Will go anywhere. Address, MINERO, Mining and Metallurgical Journal Office.

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TREMAIN Two-Stamp Steam Mill at Tucson, Arizona. 15-HP. Boiler Pump, and everything complete, set up ready for work. In excellent condition; used less than six months. Address, DREDGING MINING MACHINERY CO., Kansas City, Mo.

A LARGE Gold deposit. Will average $15.00 free gold suitable for Cyanide process. Twelve miles from railroad, in Arizona. Terms reasonable.
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FOR SALE—Manganese—An immense deposit of high-grade manganese ore; close to S. P. R. R., and but a few miles from the Pacific Coast R. R., which connects with Port Harford, where large vessels can enter. Address
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230 ACRES of patented land in one of the richest localities in California for $5,000. It is quartz property, can be worked by tunnels. Has plenty free timber; cheap water. Three miles from railroad. This is a bargain. Address
Box 209, Placerville, California.

WATER PIPE FOR SALE—23,000 feet 20-in. Cast-Iron Water Pipe, made by R. D. Wood & Co., 170 lbs. to foot, in 12-ft. lengths, in first-class condition, for re-use. Will be sold in lots to suit.
FRANK SAMUEL,
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COAL LANDS FOR SALE CHEAP.—10,000 acres best coal land in Westmoreland County, Pa., convenient to water and railroad. Three openings already made. Particulars upon application. SAM'L BORDENKIRCHER, 76 Hillsdale Ave., Cleveland, O.

PENNSYLVANIA COAL LAND FOR SALE.—20,000 acres within 18 miles of Pittsburg, on river and rail. Vein six to seven feet. All mine openings would be self-draining. Full description furnished. SAMUEL BORDENKIRCHER, 76 Hillsdale Ave, Cleveland, O.

FOR SALE.—Near Birmingham, Ala., a rich iron mine. Brown hematite ore, 26-foot vein, average 65 per cent. Also fine vein of silver and copper. For full particulars, address G. W. WRIGHT, Groesbeck, Texas.

KINDLY NOTICE
...Our...
Book Announcements
ON PAGE XXIII.

BUYERS' GUIDE

Our Buyers' Guide is arranged to assist those who expect to purchase machinery and supplies to find quickly and easily the addresses of the leading dealers. A postal card addressed to this paper will bring you the catalogues of all houses named under any classification.

AIR COMPRESSORS

Edw P Allis Co.	Milwaukee, Wis
M C Bullock Mfg Co.	Chicago, Ill
Colorado Iron Wks.	Denver, Colo
W H Emanuel,	Denver, Colo
Fairbanks, Morse & Co.	Chicago, Ill
Gates Iron Works,	Chicago, Ill
Heyman Hendy Machine Wks,	S Francisco, Cal
Henshaw, Bulkley & Co,	S Francisco, Cal
Ingersoll-Sergeant Drill Co,	N Y City
Parke & Lacy Co.	S Francisco, Cal
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Sullivan Machinery Co.	Chicago, Ill
Union Gas Engine Co,	S Francisco, Cal
Weber Gas & Gasoline Eng Co,	Kansas City, Mo
J Wigmore & Sons Co.	Los Angeles, Cal

(Continued on page XIII.)

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E G Denniston, S Francisco, Cal
Joshua Hendy Machine Wks, S Francisco, Cal
Parke & Lacy Co, S Francisco, Cal
San Francisco Novelty & Plating Wks, S Francisco, Cal
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Hamlin & Morrison, Philadelphia, Pa
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Jas Irving & Co, Los Angeles, Cal
Ogden Assay Co, Denver, Colo
R A Perez, Los Angeles, Cal
John T Reed, San Bernardino, Cal
D W Reichart, El Paso, Tex
Ricketts & Banks, N Y City
Selby Smelting & Lead Co, S Francisco, Cal
Ernest H. Simonds, S Francisco, Cal
Simonds & Wainwright, N Y City
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Wade & Wade, Los Angeles, Cal
Weis & Gibson, Chicago, Ill
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F W Braun & Co, Los Angeles, Cal
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Queen & Co, Philadelphia, Pa
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Schoellkopf, Hartford & Maclagan, N Y City
Smith & Thompson, Denver, Colo
John Taylor & Co, S Francisco, Cal
Henry Troemner, Philadelphia, Pa
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Goodyear Rubber Co, S Francisco, Cal
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I C Yawger, N Y City

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Henshaw, Bulkley & Co, S Francisco, Cal
Jas Leffel & Co, Springfield, O
Lidgerwood Mfg Co, N Y City
Chas C Moore & Co, S Francisco, Cal
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Parke & Lacy Co, S Francisco, Cal
Ruggles-Coles Engineering Co, N Y City
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CARBONS
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Parke & Lacy Co, S Francisco, Cal
Thomson & Boyle, Los Angeles, Cal
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Chrome Steel Wks, Brooklyn, N Y
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Denver Fire Clay Co, Denver, Colo
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CYANIDE
F W Braun & Co, Los Angeles, Cal
Roessler & Hasslacher Chemical Co, N Y City
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CYANIDE PLANTS
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American Diamond Rock Drill Co, N Y City
M C Bullock, Mfg Co, Chicago, Ill
Theo Lexow, N Y City
Sullivan Machinery Co, Chicago, Ill
I C Yawger, N Y City

DIAMOND DRILLS
American Diamond Rock Drill Co, N Y City
M C Bullock Mfg Co, Chicago, Ill
Joshua Hendy Machine Wks, S Francisco, Cal
Henshaw, Bulkley & Co S Francisco, Cal
Parke & Lacy Co, S Francisco, Cal
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(Continued on page XIX.)

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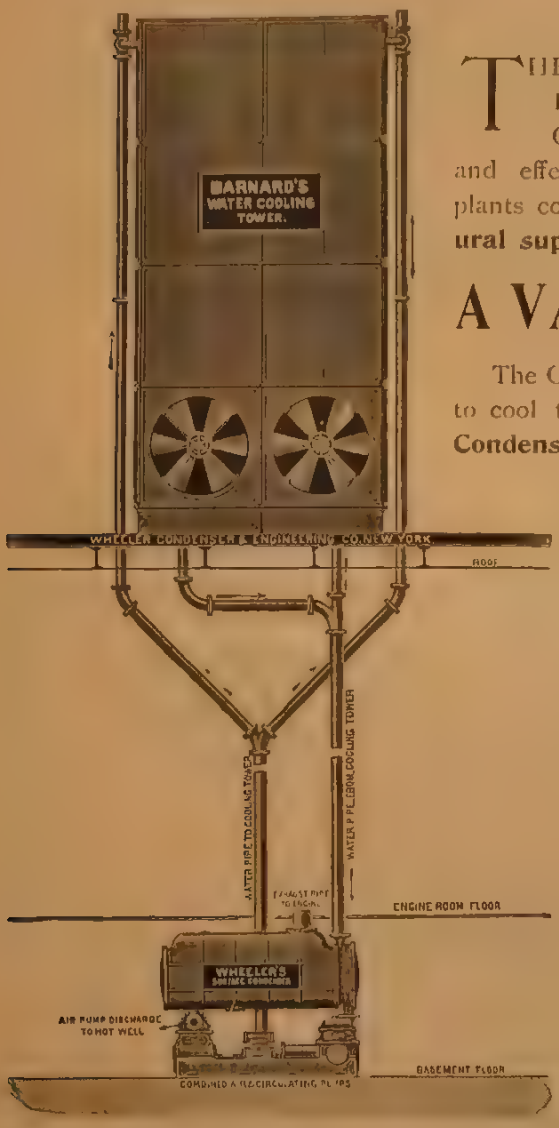

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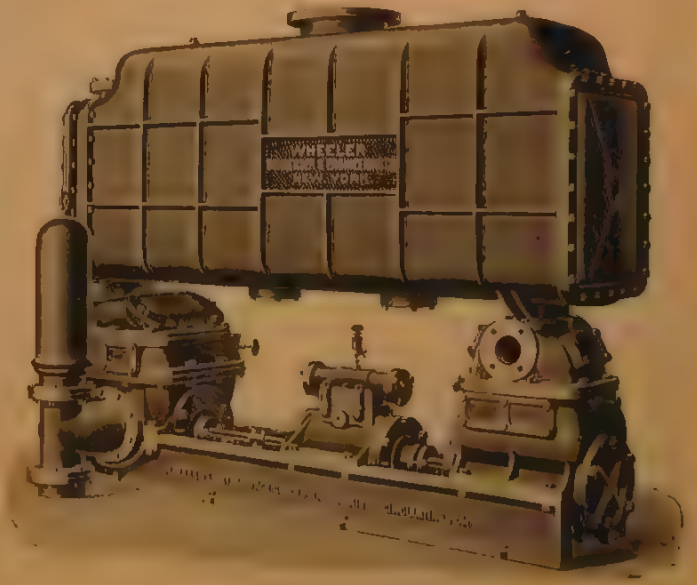

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Parke & Lacy Co, S Francisco, Cal
John Taylor & Co, S Francisco, Cal

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Colorado Iron Wks, Denver, Colo
Joshua Hendy Machine Wks, S Francisco, Cal
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